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Scientific and Technical Aerospace Reports (*STAR*) is a major component of a comprehensive National Aeronautics and Space Administration information system covering aeronautics, space, and supporting disciplines. *STAR* is issued on the 8th and 23rd of each month and announces current publications of the following types:

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- NASA FEDD (For Early Domestic Dissemination) documents
- NASA-owned patents and patent applications
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Subject scope of *STAR*, *IAA*, and *On-Going Research Projects* includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

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01 AERONAUTICS (GENERAL) 1907

02 AERODYNAMICS 1907

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

03 AIR TRANSPORTATION AND SAFETY 1910

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION 1911

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications.*

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE 1913

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

06 AIRCRAFT INSTRUMENTATION 1916

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

07 AIRCRAFT PROPULSION AND POWER 1916

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

08 AIRCRAFT STABILITY AND CONTROL 1918

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

09 RESEARCH AND SUPPORT FACILITIES (AIR) 1919

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics.*

12 ASTRONAUTICS (GENERAL) 1921

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

13 ASTRODYNAMICS 1922

Includes powered and free-flight trajectories; and orbit and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) 1924

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air).*

15 LAUNCH VEHICLES AND SPACE VEHICLES 1924

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

16 SPACE TRANSPORTATION 1925

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING 1925

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 1925

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

19 SPACECRAFT INSTRUMENTATION 1929

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

20 SPACECRAFT PROPULSION AND POWER 1929

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.

23 CHEMISTRY AND MATERIALS (GENERAL) 1931

Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 1931

Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 1933

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

26 METALLIC MATERIALS 1937

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 1942

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 1944

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

ENGINEERING

Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.

For related information see also *Physics.*

31 ENGINEERING (GENERAL) 1946

Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 1947

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

33 ELECTRONICS AND ELECTRICAL ENGINEERING 1954

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

34 FLUID MECHANICS AND HEAT TRANSFER 1960

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

35 INSTRUMENTATION AND PHOTOGRAPHY 1964

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation.*

36 LASERS AND MASERS 1970

Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 1973

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 1975

Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 1976

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

GEOSCIENCES

Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.

For related information see also *Space Sciences.*

42 GEOSCIENCES (GENERAL) 1979

43 EARTH RESOURCES 1979

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

44 ENERGY PRODUCTION AND CONVERSION 1985

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation*.

45 ENVIRONMENT POLLUTION 1990

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS 1994

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

47 METEOROLOGY AND CLIMATOLOGY 1998

Includes weather forecasting and modification.

48 OCEANOGRAPHY 2007

Includes biological, dynamic and physical oceanography; and marine resources.

LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) 2009

Includes genetics.

52 AEROSPACE MEDICINE 2013

Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES 2019

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT 2021

Includes human engineering; biotechnology; and space suits and protective clothing.

55 PLANETARY BIOLOGY 2023

Includes exobiology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) N.A.

60 COMPUTER OPERATIONS AND HARDWARE 2023

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For components see *33 Electronics and Electrical Engineering*.

61 COMPUTER PROGRAMMING AND SOFTWARE 2025

Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS 2027

Includes computer networks.

63 CYBERNETICS 2027

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support*.

64 NUMERICAL ANALYSIS 2029

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65 STATISTICS AND PROBABILITY 2030

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS 2031

Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS N.A.

Includes topology and number theory.

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.

For related information see also *Engineering*.

70 PHYSICS (GENERAL) 2031

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75 PLASMA PHYSICS 2038

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76 SOLID-STATE PHYSICS 2039

Includes superconductivity.

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77 THERMODYNAMICS AND STATISTICAL PHYSICS 2042

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) 2042

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81 ADMINISTRATION AND MANAGEMENT 2043

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Includes information storage and retrieval technology; micrography; and library science.

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84 LAW AND POLITICAL SCIENCE 2045

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85 URBAN TECHNOLOGY AND TRANSPORTATION 2045

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

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89 ASTRONOMY 2046

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

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Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 2048

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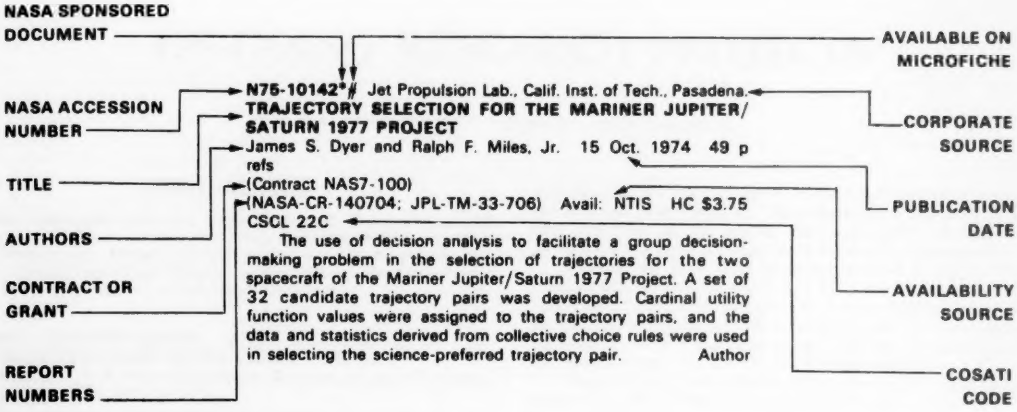

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(Contract NAS7-100)
(NASA-CR-140704; JPL-TM-33-706) Avail: NTIS HC $3.75 CSCL 22C

The use of decision analysis to facilitate a group decision-making problem in the selection of trajectories for the two spacecraft of the Mariner Jupiter/Saturn 1977 Project. A set of 32 candidate trajectory pairs was developed. Cardinal utility function values were assigned to the trajectory pairs, and the data and statistics derived from collective choice rules were used in selecting the science-preferred trajectory pair. Author

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ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research And Support Facilities (air). For Related Information See Also Astronautics.

1.0001, INVESTIGATION AND DEVELOPMENT OF CROSS-VENTED PARACHUTE CANOPY DESIGN

J.T. MATSUO, U.S. Navy, Aerospace Recovery Facil., *El Centro, California* 92243 (DN232012)

To determine the design parameters, operational characteristics, and the opening force reduction capability of the cross-vented parachute under various canopy loading conditions.

The following three basic configurations for opening force reduction and descent stability will be pursued: (1) diametrically opposite gores of the standard 28-foot diameter f. c. canopy (total geometric porosity ranging from 15 to 30%) will be replaced by marquisette/netting material; (2) enlarged center/apex vent (total geometric porosity ranging from 5 to 20%) and drag surface cloth replaced by marquisette/netting material; and (3) disc-gap-band configuration with marquisette/netting material in the gap area.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20360

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0002, PREDICTION AND VERIFICATION OF AIRCRAFT FLIGHT CONTROL SYSTEM LIFE CYCLE COSTS

J.O. COBB, Rockwell International Corp., *Los Angeles, California* 90009 (DF133830; F33615-75-C-3047)

The life cycle costs of future military aircraft must be reduced if an adequate aircraft fleet is to be acquired and supported in the presence of continued budgetary constraints. One avenue for reducing life cycle costs is through proper selection of the alternatives available during the design phase so that flight control system design alternatives which provide the most promising trade-offs between total aircraft life cycle costs and aircraft performance.

An analysis will be conducted to accomplish the above objectives. the major tasks in the analysis are- (1) the establishment of criteria and rationale for assessing the impact of the flight control system (FCS) on total aircraft life cycle costs, (2) the development of life cycle cost prediction methods, (3) an analysis of possible FCS design alternatives and the identification of the most promising design alternatives and (4) a preliminary demonstration and validation of the criteria, cost prediction methods and FCS design recommendations. This analysis is a joint effort with work unit 19870161 (AFFDL/FGL).

Supporting agency address information: AF Flight Dynamics Laboratory FGC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0003, ANALYTICAL PREDICTION OF SUPERSONIC STORE SEPARATION TRAJECTORIES

J.N. NIELSEN, Nielsen Engin. & Research Inc., *Mountain View, California* 94040 (DF134090; F33615-75-C-3053)

Self inflicted store damage is a problem with combat aircraft, therefore this objective is to develop an analytical predictive technique to predict supersonic store separation trajectories from current and future aircraft. A method to mathematically model the flow field in the region near supersonic aircraft will be developed and used to predict store separation trajectories.

Supersonic flow field mapping around a general fighter-bomber aircraft will be conducted in Tunnel A at AEDC to provide a data base for development of a mathematical model of such flow fields. Using the math model developed, flow fields and store separation trajectories predictions will be compared to those measured in the wind tunnel to verify the technique.

Supporting agency address information: AF Flight Dynamics Laboratory FGC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0004, TURBULENCE MEASUREMENTS IN A COOLED-WALL SUPERSONIC BOUNDARY LAYER 12505-E

A. DEMETRIADES, Philco Ford Corporation, *Newport Beach, California* 92663 (DA0F5575; DAHC04-75-C-0014)

A controlled experiment will be performed to generate a supersonic turbulent boundary layer over a cooled surface. Mean flow profiles, fluctuation magnitudes and shear stresses will be measured. Relevance - this work is relevant to a number of MICOM activities since the turbulent boundary layer is an important element of missile aerodynamics. In addition, the proposed work supplements the turbulent boundary layer research, including turbulence measurements using hot wire anemometry, now being conducted at the exterior ballistics laboratory of the ballistic research laboratories.

A well-calibrated continuous Mach 3 air wind tunnel will be utilized to generate a supersonic boundary layer on a flat plate. The hot-wire anemometer will be used for making temperature fluctuation measurements for a range of wall temperatures and the cross-wire technique will be used for measurement of shear stresses.

Supporting agency address information: AMC Army Research Office, Box CM, Duke Station, Durham, NC 27706

SUPPORTED BY U.S. Dept. of Defense - Army

1.0005, AUTOMATIC EXTERNAL LOAD ACQUISITION BY HELICOPTERS

D.T. LIU, System Innovation & Dev. Co., *Palos Verdes Peninsula, California* 90274 (DA0C4075; DAAJ02-72-C-0067)

Present practice for acquisition of external payloads by helicopters is for a ground crewman to manually attach the sling to the helicopter. The crewman must stand in the rotor downwash, sometimes on top of the payload, while the helicopter hovers just over his head. In addition, as larger helicopters enter the system, it may be impossible for a man to lift the sling to manually effect the hook-up. The purpose of this work is to improve personnnel and aircraft safety, reduce load acquisition time, and increase the overall effectiveness of helicopter external cargo operations.

Survey typical payloads to establish attachment criteria. Perform design concept investigation of candidate methods for pick-up of external payloads without manual assistance during pick-up. Conduct trade-off analysis to determine most promising concept. Perform preliminary design of promising concept.

Supporting agency address information: AVCOM Air Mobility R&D Lab., Ft. Eustis, Va. 23604.

SUPPORTED BY U.S. Dept. of Defense - Army

1.0006, AIRFLOW GENERATION

G.E. MONCSKO, U.S. Navy, Systems Development Department, *Ridgecrest, California* 93555 (DN482309)

To upgrade aircraft survivability test facility to allow simulation of in-flight flow field around aircraft test specimens.

The engine mounting pad and the turbofan engine support equipment (fuel and lubricating system, remote fire fighting, and remote engine air start) will be designed and fabricated. The design will be for two TF-33 turbojet engines and will allow for expansion to four engines.

Supporting agency address information: Naval Air Systems Command ADV A/C Dev & Sys Objectives Off (03PAF), Washington, D.C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0007, DEVELOPMENTAL STUDY OF ROTARY ELECTRO-MECHANICAL ACTUATION FOR MILITARY AIRCRAFT OR MISSILES

N.E. WOOD, Garrett Corporation, *Torrance, California* 90509 (DF133880; F33615-75-C-3055)

The needs of survivability and safety of military aircraft cannot be allowed to depend entirely on hydraulically powered control surfaces if any reasonable alternatives can be demonstrated. The objective of this program is to investigate, develop, and evaluate the use of integrated-hinge (rotary) electromechanical actuators for low-power (3 h.p. maximum) airplane control surface actuation. A primary use of these actuators is conceived as actuating small chord trailing edge flaps on larger control surfaces where linear actuators are at a disadvantage in finding space for installation and in providing the conversion to rotary motion. This program will provide needed data concerning the feasibility of electrically powered control surface actuation for military airplanes and other space vehicles.

The development will include investigation by analytical means of the feasibility of control surface actuation using electrical power only and selection and preliminary design of the most promising concept, specifications thereof, and a preliminary test and development plan. Pending approval by the Air Force, the selected actuation system will be designed, fabricated and tested.

Supporting agency address information: AF Flight Dynamics Laboratory FGL, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0008, AIRCRAFT FUEL TANK/SYSTEM DATA ANALYSIS

A. STEIN, Falcon Research & Dev. Company, *Denver, Colorado* 80218 (DF134040; F33615-75-C-3060)

A major cause of combat losses is due to the high vulnerability of aircraft fuel tank/systems to nonnuclear threats. This program is part of an overall effort of the Air Force to permit realistic assessment of the fuel tank/system response to nonnuclear threat penetration. The output of this program shall serve as updated input for a design tool such as the aircraft fuel tank/system analysis computer code which enables the designer to incorporate survivability features into aircraft design.

The program is divided into four parts- 1) locating and gathering existing data which are related to fuel tank system damage and failure, 2) the reduction of the data into a convenient and standard form, 3) the analysis of the data to determine the main interactive effects, and 4) the verification or development of empirical relationships describing the probabilities of occurrence and the extent of the damage and failure.

Supporting agency address information: AF Flight Dynamics Laboratory PTS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0009, ANALYTICAL AND EXPERIMENTAL STUDY OF SUBSONIC STALLED FLUTTER

R.A. ARNOLDI, United Aircraft Corporation, *Hartford, Connecticut* 06118 (DF040980; F44620-75-C-0066)

A 12-month program to perform a combined experimental and analytical study of the dynamic stall phenomenon in multiblade systems. This study will be comprised of a set of unsteady cascade experiments with operation into the dynamic stall regime, and of an analytical program to correlate the data with an unsteady separated flow cascade analysis. At the present time, new engines are designed using empirical correlations that were developed through experimental programs on previous engines. This procedure presupposes that advanced engine designs (and the solutions to their design problems) can be extrapolated from previous engine experience. At best, this allows for small increments of improvement, and at worst, constitutes an expensive and time consuming trial and error procedure. A cascade stall flutter analysis that gas turbine engine designers can use to ensure flutter- free blade rows is needed. To provide an important first step to a cascade stall flutter prediction system, a two task program involving a combination of basic experimentation and theoretical study is proposed. The first task will be devoted to obtaining basic data concerning the unsteady subsonic flow of a fluid through a cascade of oscillating airfoils at moderate to high incidence. Fundamental information will be obtained to determine the effect of loading up to and beyond the static point on the unsteady chordwise pressure distribution on a cascaded airfoil, and on the way in which the flow over such an airfoil separates. The second task will be directed toward including the information obtained in the first task into an advanced unsteady separated flow cascade analysis and comparing the analytical results with the experimental data.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd, Arlington, Va 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0010, RESEARCH ON SUPERSONIC CHORDWISE BENDING IN FLUTTER CASCADES

A.A. MIKOLAJCZAK, United Aircraft Corporation, *Hartford, Connecticut* 06118 (DN490065; N00019-74-C-0305)

To investigate supersonic chordwise bending flutter in compressor airfoils.

The work consists of a combined analytical and experimental program with the objective of attaining an understanding of the characteristics of supersonic chordwise bending flutter, and using this understanding to identify methods for eliminating this form of flutter.

Supporting agency address information: Naval Air Systems Command 310, Washington, D.C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0011, HIGH THROUGH FLOW TURBOFAN COMPRESSOR DEVELOPMENT

N.T. MONSARRAT, United Aircraft Corporation, *Hartford, Connecticut* 06118 (DN596802; N00140-73-C-0683)

Design and fabricate and test an advanced technology high through flow compressor for future aircraft gas turbine engines. High through flow means that the axial Mach number throughout the compressor is higher than current production machinery, thus increasing the pressure rise capability for a given number of compressor stages. It is this increased pressure capability which affords a dramatic saving in compressor stages for a given overall pressure ratio.

Conduct an aerodynamic design of an advanced technology five-stage 6:1 pressure ratio high through-flow compressor application in the high spool of a turbofan. Perform vane and blade flutter and stress calculations plus stress analyses of disk and case structures. Complete a mechanical design of compressor disks, blades and stators, based on aerodynamic structural design. Conduct an aerodynamic design of an advanced technology six-stage 11.5:1 pressure ratio high through flow compressor for application as a single spool turbojet. Perform stability audit. Fabricate one set plus appropriate spares of compressor hardware consisting of disks, blades and stators for turbofan application. Assemble the compressor turbofan core hardware. Conduct approximately 20 hours of sea level test of turbofan compressor hardware.

Supporting agency address information: Naval Air Propulsion Test Center, Research and Technology Group (PE4), Trenton, N J 08628 9

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0012, SWIRL BURNING AUGMENTATION FEASIBILITY

R. REILLY, United Aircraft Corporation, *Hartford*, *Connecticut* 06118 (DN596800; N00019-72-C-0612)

The objective of the augmentation program is to demonstrate the feasibility and performance capability of a new combustion concept (swirl burning). The program is aimed at documenting improvements in the areas of reliability, hot and cold pressure loss, fuel preparation, combustion performance, and system integration.

Conduct technology studies to establish augmenter requirements and provide guidance for design and rig test configurations. These analytical studies will consider a range of potential applications. Rig testing of the three configurations listed as follows to provide sufficient basic data to allow evaluation of this concept for an advanced augmenter application: (a) TF30-p-412 V-gutter augmenter; (b) vortex burning and mixing (VORBIX); (c) vaned cascade. Prepare a full- scale design configuration presenting the optimum system determine from the analytical study and the rig test program.

Supporting agency address information: Naval Air Propulsion Test Center, Research and Technology Group (PE4), Trenton, N J 08628

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0013, INVESTIGATION OF FACTORS CONTROLLING ENGINE SCHEDULED OVERHAUL INTERVALS

P.A. KING, Avco Corporation, *Stratford*, *Connecticut* 06497 (DA0D3980; DAAJ02-75-C-0018)

Perform a detailed review and analysis of all applicable technical factors affecting the establishment and growth of scheduled overhaul intervals of aircraft turbine engines to determine the engine design, test and airframe integration requirements essential to achieve a significant increase in initial TBO's and TBO growth rates. The results will provide a basis for TBO control of current and future Army turbine engines.

Review past turbo-shaft engine reliability behavior, design margins, fault warning, and developmental testing to establish causal factors for low, or limited, scheduled overhaul intervals. Upon assessment of degree of responsibility of each causal factor, criteria and recommendations are to be generated which would lead to high initial TBO's and rapid TBO growth for future engine programs.

Supporting agency address information: AVSCOM Air Mobility Research and Development Laboratory, Eustis Directorate, Ft. Eustis, Va 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0014, AEROELASTIC ROTOR STABILITY ANALYSIS

R.G. CARLSON, Sikorsky Aircraft, *Stratford*, *Connecticut* 06602 (DA0D3893; DAAJ02-74-C-0010)

The objective of this program is to produce a practical analytical tool which will evaluate the inherent aeroelastic stability of a specific rotor system design.

An analysis will be developed and a computer program written to directly determine the characteristic values of the dynamic equations of motion of a helicopter rotor system. The equations would include coupling with rotor control system and would be applicable for hovering as well as forward flight conditions up to an advance ratio of 9k. Emphasis will be placed on a computer analysis which can rapidly and directly produce rotor damping ratios and time dependent amplitude decay rates which can be rapidly evaluated to determine rotor stability.

Supporting agency address information: AMC Eustis Directorate, Air Mobility Research and Development Laboratory, Ft. Eustis, Va 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0015, YUH-60A OPERATIONAL STATISTICS

R. CASERIA, Sikorsky Aircraft, *Stratford*, *Connecticut* 06602 (DA0D3975; DAAJ02-75-C-0003)

Evaluate the YUH-60A UTTAS helicopter under various reliability, operational and maintenance assumptions in both the R&M and ARMS models.

The UTTAS operational scenario will be simulated with the UH-1N/R&M model. The YUH-60A UTTAS helicopter using 'mature' R&M data will be simulated with the R&M model (YUH-60A/R&M) using the UTTAS operational scenario. The YUH-60A UTTAS helicopter will be input in the ARMS (aircraft reliability and maintainability simulation) model with a detailed operational, resource, and logistics scenario.

Supporting agency address information: AVSCOM Eustis Directorate, Air Mobility Research and Development Laboratory, Ft. Eustis, Va 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0016, EFFECT OF AN ABATEMENT DEVICE ON A WING TIP VORTEX GENERATED BY MILITARY AIRCRAFT

S.W. YUAN, George Washington University, School of Engineering, *Washington*, *District of Columbia* 20037 (DF127750; F33615-73-C-3097)

USAF dollar losses have amounted to $3,000,000 per year due to wake turbulence encounters. The possibility exists that an abatement system mounted in the wing tip may restructure the wake vorticity behind an aircraft so that the hazard and USAF dollar losses associated with wake turbulence encounters may be significantly reduced. The objective of this program is to investigate the use of an abatement system to reduce the strength of wake turbulence behind a wing.

To conduct an experimental investigation on the effect of an abatement system upon the rollup and formation of the tip trailed vortices behind a wing. An existing model wing will be used during experimentation. Pressure measurements will be made on the surfaces of the wing. The wake behind the wing will be traversed by means of hot wire so that the effect of the abatement device upon the wake turbulence behind the wing can be assessed.

Supporting agency address information: AF Flight Dynamics Laboratory FGC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0017, EJECTOR THRUST AUGMENTOR WIND TUNNEL TESTING

D.G. KOENIG, U.S. Natl. Aero. & Space Adm., *Washington, District of Columbia* 20553 (DF131370)

The aerodynamic performance of an ejector thrust augmentor (ETA) wing cannot be predicted sufficiently for use in aircraft design. To provide adequate aerodynamic technology for future fighter designs, the problems of ETA wing performance, including inlet flow, BLC control, and the force and moment characteristics must be solved. The objective is to measure performance by fabricating and testing two wind tunnel models of ETA wings. The measurements made in these tests will validate configuration concepts and reveal areas of possible improvement. One of the wings will be a full scale model of the proposed ETA RPV demonstrator, so the test results will be directly applicable to that design.

AFFDL and NASA Ames will conduct a joint ETA wind tunnel test program. Two semi-span ETA wing models will be fabricated for testing at NASA Ames. One model will represent a STOL configuration and the other a V/STOL configuration. These models will be tested in low speed tunnels to assess the hover and transition characteristics. The wind tunnel balance systems will be used to acquire force and moment data, while pressure rakes will be used for flow field analysis. The effort is dependent on the timely fabrication of the hypermixing nozzles for the augmentors.

Supporting agency address information: AF Flight Dynamics Laboratory PTC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0018, STABILITY AND CONTROL PREDICTION FOR MANEUVERABLE MISSILES

J. FIDLER, Martin Marietta Corporation, *Orlando*, *Florida* 32805 (DF133870; F33615-75-C-3052)

Problems with stability and control technology base for multi- purpose missiles and maneuverable missiles require on going research and technology. The objective of this effort is to develop a better stability and control technology base for preliminary design of missiles, by using semi-empirical (DATCOM-type) methods from the stability and control prediction processes. Methods will be developed for body alone and cruciform missiles at angles of attack up to 180 degrees in subsonic through supersonic flight.

The approach will consist of (1) review of available prediction methods and wind tunnel/flight test data and (2) formulation of semi- empirical (DATCOM-type) methods.

Supporting agency address information: AF Flight Dynamics Laboratory FGC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0019, CONTROL CONFIGURED PROPULSION (CCP) DESIGN CRITERIA DEFINITION

R. MILLER, United Aircraft Corporation, *West Palm Beach, Florida* 33402 (DF134240; F33615-75-C-3107)

To achieve maximum military aircraft maneuvering performance, it is anticipated the concepts of flight/propulsion control coupling (FPCC) will be used. Such concepts will be mandatory in aircraft designs which incorporate aerodynamic propulsive interactive force (APIF) systems, such as vectored thrust and jet flap configurations. The propulsion units in these configurations would then be 'flight control' elements. Consequently, the selection of propulsion unit and its control system must be based almost equally on both vehicle performance and flight control requirements. It will be necessary to maximize propulsion system performance in both steady state and dynamic aspects. This program undertakes an approach to propulsion selection, termed the control configured propulsion (CCP) approach. The objective of this program is to investigate design and control criteria for a flight control optimized propulsion unit, configured in all pertinent aspects for blending of propulsion induced forces with aerodynamic control devices.

A system approach to the total vehicle will be taken, focusing on the propulsion unit and its control system design requirements as would stem from vehicle mission/operational/design requirements and constraints. A cursory treatment will be given to a wide spectrum of vehicles, propulsion cycles and propulsion control, flight control and APIF concepts. Potential design criteria for propulsion units and their controllers will be identified, categorized and ranked in accordance with their impact on items such as flight performance/control/safety/survivability, pilot load and acceptability. Results will be screened for identifying future R&D requirements.

Supporting agency address information: AF Flight Dynamics Laboratory FGL, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0020, EVALUATION OF 3-D TURBULENCE TECHNIQUES FOR DESIGNING MILITARY AIRCRAFT

F.D. EICHENBAUM, Lockheed Georgia Company, *Marietta, Georgia* 30060 (DF129780; F33615-74-C-3004)

There is a need for design procedures for advanced military aircraft that will insure safe structures relative to atmospheric gust loads. The objective of this program is to develop design procedures for calculating the response of structures to three-dimensional turbulence. Current design methods include only the response to the vertical component of turbulence. The results of this effort will be used to update gust response methods and develop more reliable methods of designing military aircraft for gust at minimum cost.

Calculations will be from analytical models and compared with data derived from dynamic response flight measured data from C-5, if available, otherwise from C-141 aircraft. These data will be used in conjunction with the new design procedures to validate these procedures.

Supporting agency address information: AF Flight Dynamics Laboratory FBE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0021, SEPARATED FLOWS IN TRANSONIC AND SUBSONIC FLOW REGIMES - POST LRCP PROGRAM AT US ARMY MISSILE COMMAND 12849-R-E

W. CHOW, Univ. of Illinois, Graduate School, *Urbana, Illinois* 61801 (DA0E8999; DAHC04-75-G-0041)

An analytical method for predicting separated flows with fixed point of separation in the transonic or subsonic flow regime for arbitrary body shapes will be developed. Methods for solution of transonic and subsonic separated flows is an area in which the missile command has a high degree of interest since current techniques contain limitations due to lack of knowledge. New methods are needed for the design of high performance missiles.

Particular attention shall be attributed to problems with fixed point of separation so that the effect of mixing, recompression, reattachment and redevelopment of the viscous flow by virtue of the interaction flow regime is solved in an iterative manner between the potential flow solution and a momentum integral formulation for the viscous mixing region.

Supporting agency address information: AMC Army Rsch Office (ARO- D), Durham, NC 28206

SUPPORTED BY U.S. Dept. of Defense - Army

1.0022, ALTERNATIVES FOR JET ENGINE CONTROL

R.J. LEAKE, Univ. of Notre Dame, School of Engineering, *Notre Dame, Indiana* 46556 (NSG 3048; 505-05-11)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0023, LAMINAR AND TURBULENT AERODYNAMIC EFFECTS OF STEADY AND UNSTEADY DIFFUSION ABOUT WING SURFACES

V.W. NEE, Univ. of Notre Dame, School of Engineering, *Notre Dame, Indiana* 46556 (DF039330; AF-AFOSR-2706-74)

Weapon delivery is an AF function which requires the operation of aerospace vehicles in the atmosphere. The interaction of these vehicles with the medium through which they fly must be better understood if improved prediction methods are to be devised for use by the design engineer. The boundary layer and the near wake region are important areas of a vehicle's flow field because they influence such important parameters as heat transfer rates, skin friction coefficient, lift and drag coefficients, lift distribution, etc. This research will provide insight and understanding of the phenomena involved in aerodynamics of moving objects in the air, as well as a guide for the design of aircraft, weapons, or missiles. This effort is concerned with two problems of basic interest in fluid mechanics. The first group of problems concerns with the diffusion of vorticity in a laminar flow. With the sudden removal of nonslip wall conditions, the unsteady change of the flow field can be investigated in various aspects. By cutting off the source of vorticity, the effect of viscous diffusion among various mechanisms involved can be revealed in a new light. Analysis, together with numerical integration, is being made to obtain the solution. The second group of problems is that of the turbulent shear flow. Various turbulent flow phenomena including ambient heat transfer will be investigated.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd, Arlington, Va 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0024, PARAMETER ESTIMATION OF AEROELASTIC VEHICLES

T.G. SWANEY, Boeing Company, *Wichita, Kansas* (DF133790; F33615-75-C-3024)

The performance of strategic and transport military aircraft can be adversely affected by aeroelastic stability and control phenomena. The objective of this work is to develop a computerized method that will estimate the flexible aircraft aerodynamic parameters from flight test experimental data. This task will reduce time required to flight test and qualify high performance aircraft, thus reducing the cost of procuring new military aircraft systems.

This is the first of a planned three part effort to develop a parameter estimation method. This work effort will develop a computerized method that is applicable to flexible aircraft in symmetric flight and described by linearized ordinary differential equations. The B-52E, C-5A or the B-1 aircraft will be used to verify the computerized method. The CCVMOD computer program will provide an analytical test case.

Supporting agency address information: AF Flight Dynamics Laboratory FGC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0025, SHORT-RANGE VISIBILITY FORECASTING

W.S. HERING, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF243930)

AF function - aircraft launch and recovery operations. Deficiency - inadequacy of present short-range forecasts of airfield visibility conditions. Objective - develop and evaluate new techniques for visibility forecasting based upon automated observations from a dense network of observing stations near the airfield. How developement contributes - provides a rational basis to assess operational effectiveness of automated observing and forecasting systems for terminal weather warnings and forecasts.

The field test facility established near L.G. Hanscom Field, Mass., is used to explore the benefits to be derived from dense networks of automated remote stations. Visibility forecasting experiments are made under varying weather conditions, including rain, snow, advection fog and radiation fog. Achievement is determined through comparison with statistical-climatological control forecasts. The results are evaluated with respect to weather type, station density, and such human factors as individual forecasting skill and experience.

Supporting agency address information: AF Cambridge Research Laboratories LY, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0026, ANALYSIS OF MINNESOTA 73 DATA

Y. IZUMI, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF243870)

AF function - low-level performance of remotely-piloted vehicles. Laser propagation and optical tracking systems. Deficiency or opportunity - knowledge of effects of turbulence on Air Force systems operating in or through the boundary layer is inadequate. Objective - detailed analyses of boundary layer turbulence data obtained in a joint experiment with British meteorological office at AFCRL Minnesota site in 1973. How development contributes - provides basis for relating characteristic turbulence properties to time of day, height, and large- scale weather conditions in order to render research results universally applicable.

The general approach is to analyze the data to determine the distribution of turbulent energy as a function of eddy size, to establish the importance of long-term trends, and to search for similarity parameters which provide universal characterization of the turbulent flow. These types of analyses are critical for the most effective use of the research data obtained, both for application to Air Force problems and for indicating further fruitful research avenues.

Supporting agency address information: AF Cambridge Research Laboratories LY, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0027, OPTIMAL CONTROL OF FLEXIBLE AIRCRAFT

F. KONAR, Honeywell Incorporated, *Minneapolis, Minnesota* 55413 (DF133840; F33615-75-C-3046)

The mission payload capability of large transport aircraft such as the C-5A can be adversely affected by the lightly damped dynamic motions of the center of mass and the structure of the aircraft. If this lightly damped motion is not adequately controlled, the fatigue life and ride quality of the aircraft are adversely affected. The objective of this work is to develop an optimal control synthesis technique that will rapidly design a control system for lightly damped motions. This synthesis technique will reduce the engineering manhours presently required for flight control system design.

The work effort will begin with an in-house survey of the optimal control synthesis methods. Those methods presently available to the AFFDL will be applied to the C-5A ALDCS design problem using the CCVMOD analytical representation of the C-5A. This application will include a study of the various mathematical idealizations of the sensors. Once the most promising optimal control method is identified, a contractual effort will be initiated to study the control synthesis problem in detail and to develop an efficient optimal control program for military aircraft.

Supporting agency address information: AF Flight Dynamics Laboratory FGC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0028, DEVELOP A NEW PAVEMENT DESIGN METHODOLOGY

UNKNOWN, U.S. Army, Waterways Experiment Station, *Vicksburg, Mississippi* 39180 (082-420-034; 045431 (TRAIS NO.))

This agreement is to furnish all personnel, materials and equipment to develop a new pavement design methodology based on a 'rational' approach as opposed to existing empirical methods in accordance with FAA-ER-430-002 titled 'New Pavement Design Methodology.'

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0029, DIRECT FORCE CONTROL OF ADVANCED TACTICAL FIGHTERS

R.V. BRULLE, McDonnell Douglas Astron. Co., *St. Louis, Missouri* 63166 (DF133820; F33615-75-C-3070)

Increasingly stringent military tactical airplane mission requirements create a problem of providing adequate mission effectiveness and performance capability at a reasonable cost. Advances in airplane stability and control technology have introduced new control methods with much potential for improving the performance and effectiveness of tactical airplanes. The objective of this effort is to investigate the new methods of direct lift and sideforce control to: (1) define how they may be most effectively applied to enhance the tactical mission effectiveness of advanced military aircraft; (2) establish criteria for trade-offs between performance and flying qualities with possible implications on system cost. The results of this effort will be valuable in developing as well as evaluating advanced tactical aircraft designs to achieve the highest possible mission effectiveness while making the best use of advanced technologies.

Design a simulation study involving specific tactical airplane tasks/maneuvers and various combinations of side force and lift control authorities and vehicle dynamics. Define best approach to measure task performance and pilot workload to correlate with verbal pilot data. Determine data needed to define control authorities which most enhance tactical airplane flying qualities and develop related design criteria. Program will be conducted in two phases to look at side force and lift control independently.

Supporting agency address information: AF Flight Dynamics Laboratory FGC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0030, DIGITAL DATCOM EXTENSION PROGRAM OF AIRCRAFT STABILITY AND CONTROL

J.E. WILLIAMS, McDonnell Douglas Astron. Co., *St. Louis, Missouri* 63166 (DF134480; F33615-75-C-3043)

Rapid and inexpensive methods for predicting the aerodynamic stability and control characteristics of air force weapon systems are needed. The availability of these methods will lead to better aircraft designs by permitting rational trade-offs to be considered early in the design. The objective of this work unit is to extend the capability which now exists in the USAF stability and control digital DATCOM by (1) permitting the program to accept a greater variety of configuration types, and (2) extending the range of flight conditions at which predictions are possible, and (3) reducing analysis time by simplifying input.

Digital DATCOM now requires, as input, the 2-dimensional aerodynamic characteristics of the airfoil sections of each lifting surface. Automated prediction of these characteristics will be incorporated into the program. The experimental data substitution option of the program now permits substitution of experimental characteristics for which DATCOM predictions are available. Therefore, experimental data can now be used to improve accuracy but not to extend the applicability of the methods. Methods will be programmed which will use empirical characteristics (for which prediction methods do not exist) as a base to provide predictions over an expanded range of flight conditions and configuration types.

Supporting agency address information: AF Flight Dynamics Laboratory FGC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0031, INTERMITTENT BOUNDARY LAYER BLOWING FOR INCREASED FIGHTER INTERCEPTOR TRANSONIC MANEUVERABILITY

W.L. ELY, McDonnell Douglas Corporation, *St. Louis, Missouri* 63166 (DF129700; F33615-73-C-3056)

Air superiority combat aircraft are required to perform high gravity combat maneuvers under a wide range of speed and altitude conditions. In the transonic speed range, special problems such as the drag rise, buffet, etc., limit the combat potential of such aircraft. This effort will investigate methods for improving the transonic maneuverability of combat aircraft. The objective of this effort is to determine if increased transonic maneuverability can be obtained through control of shock induced separation using intermittent blowing from spanwise slots, jet flaps and air jet vortex generators.

An experimental program will be conducted to determine the effectiveness of intermittent blowing devices. Their effectiveness will be determined by noting the effect on shock induced boundary layer separation, lift efficiency, thrust recovery and buffet onset. An existing model configured for steady state blowing will be modified and tested. The results will be compared to steady state results.

Supporting agency address information: AF Flight Dynamics Laboratory FXM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0032, INVESTIGATION OF NONAXISYMMETRIC NOZZLES INSTALLED IN TACTICAL AIRCRAFT

P.E. HILEY, McDonnell Douglas Corporation, *St. Louis, Missouri* 63166 (DF130150; F33615-74-C-3009)

Excessive airframe/exhaust nozzle interference drag of transonic and supersonic tactical or strategic aircraft is directly related to technological deficiencies in current configuration concepts and performance prediction capabilities. This effort addresses the broad problem of developing design criteria for reducing airframe exhaust interference drag and for enhancing maneuverability for advanced tactical aircraft. The technical objectives of the effort are to determine range, lift augmentation, and maneuverability improvements for aircraft configurations utilizing non-axisymmetric aftbody/nacelles/nozzles and the thrust vectoring concepts consistent with those nozzle configurations. Such improvements in performance and maneuverability could result in decreased aircraft weight and lead to lower production and operating costs, as well as providing an improved force capability.

The program which is intended to pursue revolutionary configurations and approaches, consists of three phases, the first of which is a concept formulation phase. During the second phase, a comparison will be made between the new, conceptual designs and conventional configurations. The more promising designs will be selected for future analyses and tests. The final phase will consist of detailing the test and analytical procedures that will be required to determine the designs which provide the best performance, and to demonstrate the feasibility of this new technology.

Supporting agency address information: AF Flight Dynamics Laboratory FXM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0033, STRUCTURAL ANALYSIS FOR INCREASED GROSS WEIGHT OF THE TIFS AIRPLANE

P.A. REYNOLDS, Calspan Corporation, *Buffalo, New York* 14221 (DF130390; F33615-73-C-3051)

Limitations in ground based simulation for providing realistic or sufficient motion and visual cues has resulted in the Air Force developing in-flight variable stability airplanes. These airplanes are used to investigate all aspects of flight control technology problems, and are directed toward advancement of the state-of-the-art and the development of criteria for new system design. The NC131H, TIFS airplane currently involved in simulation testing for advanced strategic airplanes is limited in test duration by the inability to carry sufficient fuel. The objective of this effort is to perform an analysis that will allow an expansion of the gross weight limit to enable it to carry more fuel and extend its flight time.

The existing original structure of the C131 was originally designed to carry additional weight in the turboprop engine configuration. Extensive modification was done on the structure of the TIFS airplane in the conversion to the in-flight simulator. Analysis will be done for the critical structrual components at the critical flight conditions to verify that the TIFS airplane is able to fly at the higher gross weights.

Supporting agency address information: AF Flight Dynamics Laboratory FGF, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0034, MILITARY AIRCRAFT AIR CUSHION LANDING SYSTEM (ACLS) SUCTION BRAKING EVALUATION

D.T. EARL, Textron Incorporated, *Buffalo, New York* 14205 (DF134390; F33615-75-C-3038)

Present air cushion landing systems, ACLS, are capable of providing only limited braking during aircraft landing which results in restricting the operation of ACLS-equipped aircraft from sites having limited runway length. The objective of this work unit is to develop and evaluate a new method to improve ACLS braking by the reduction of air cushion cavity pressure. An ACLS-equipped aircraft with increased braking capability will provide a new dimension for tactical aircraft flexibility and mobility through its ability to operate at various small ground sites having austere low strength soil, mud, water, etc., surfaces.

The reduction of ACLS cushion cavity pressure from 60 psfg to ambient or below, causes an increasing amount of the aircraft load, as pressure decreases, to be transferred to brake pad strips located on the trunk, thereby increasing the braking effectiveness of the brake pads. TIPS turbine fans will be installed in an LA-4 ACLS-equipped aircraft to draw air from the cushion cavity and thereby increase the load on the trunk pad strip brakes. Cushion pressure will be maintained at an equilibrium by the installation of a lateral dump port from the fan plenum. Other minor modifications will be made to the ACLS system to insure full ACLS operation capability. The technique will be tested using two types of trunks, a two-way stretch elastic and an inelastic trunk system. Each modified ACLS trunk system will undergo pull tests, and low and high speed taxi tests. Resulting data will be evaluated and extrapolated to the C-115, C-130, and JINDIVIK drone aircraft.

Supporting agency address information: AF Flight Dynamics Laboratory FEM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0035, INTERFERENCE DUE TO PERFORATED WALLS AT TRANSONIC SPEEDS

T.R. GOODMAN, Oceanics Incorporated, *Hicksville, New York* 11803 (DF034950; F44620-72-C-0079)

Weapons delivery, air superiority and logistic support all require the AF to operate and maneuver at transonic speeds. With the trend towards larger and/or higher performance transonic vehicles, engineering design will have to be reduced to a more rigorous science theory than is now possible with the present state of knowledge or laboratory simulation of transonic flow. Of prime interest for the future will be the ability of the scientist and engineer to obtain model data of unprecedented accuracy in transonic wind tunnels, thereby minimizing the costly consequences of small errors in wind tunnel results when applied to the full scale vehicle. One of the parameters involved in analyzing wind tunnel data is the interference effects of the wind tunnel walls on the flow, particularly when lifting surfaces are involved. This year's effort will be devoted primarily to testing the wall-interference theory developed under previous support by using the hydraulic analogy of a perforated wall thereby simulating a transonic wind tunnel in the properly modified oceanics water tunnel.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd, Arlington, Va 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0036, DESIGN, FABRICATE AND TEST TRUNK AND STOWAGE SYSTEM FOR A RPV AIR CUSHION RECOVERY SYSTEM

D. EWING, B.F. Goodrich Company, *Akron, Ohio* 44311 (DF130860; F33615-74-C-3032)

Presently, the recovery of drones and remotely piloted vehicles (RPV) is done by parachute or mid air retrievals. These methods result in high operating costs, low sortie rates, and restrict operational and deployment mobility. As mission requirements increase, RPV size increases which amplifies operating costs and other RPV retrieval problems. The AFFDL has established the mission and cost effectiveness of adapting an air cushion landing system (ACLS) to a RPV for launch and recovery. The objective of this work unit is to design, fabricate, test and install an ACLS trunk and stowage system on a JINDIVIK RPV. It is one of four work units aimed at making an ACLS equipped Austrialian JINDIVIK RPV ready for flight test in FY 75. This flight test will verify that ACLS equipped RPV will provide significant improvements in RPV deployment and mobility, up to a 90 percent reduction in RPV recovery cost, and an 80 percent reduction in RPV turn around time.

A detailed design and analysis will be prepared for the ACLS trunk and stowage system, which will be verified. Then, the ACLS trunk and stowage system will be fabricated and verified by both off and on the RPV testing. Lastly, as built drawings, specifications and a report of work done will be prepared.

Supporting agency address information: AF Flight Dynamics Laboratory FEM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0037, ADVANCED ENGINE INSTRUMENTATION APPLICATION TO FLIGHT/PROPULSION CONTROL COUPLING FOR COMBAT AIRCRAFT

T.L. SCHILLING, General Electric Company, *Cincinnati, Ohio* 45215 (DF129960; F33615-73-C-3036)

To achieve best performance from future aircraft in combat situations, it will be necessary to get maximum propulsion system performance, steady state and dynamic. Also to achieve maximum vehicle performance, it is anticipated that flight controls and engine controls must be closely coupled, sometimes without the pilot being a functional part of the coupled control. Recent advancements in measurement technology promise to provide engine data, heretofore not directly available, that will enhance the control coupling and improve dynamic engine performance such that the engine can function as a primary control force, in conventionally flying aircraft, as well as V/STOL. This control coupling is expected to be especially important for high performance aircraft (Mach 3 and up) and remotely piloted vehicles. This program will define the potential of new instrumentation technology in providing control coupling parameters for advanced combat aircraft.

Advanced measurement systems' characteristics will be iteratively applied to engine management and control. Through available dynamic simulation methods, the parameters and locations of measurement will be analyzed to determine the effects on performance, steady state and dynamic, as are related to mission management and flight control coupling. Tentatively, the measurements to be analyzed will be: air and combustion gas mass flow, local and average gas densities, fuel-air ratio, and fuel energy content. Performance requirements for the respective measurements will also be determined.

Supporting agency address information: AF Flight Dynamics Laboratory FGL, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0038, DEVELOPMENT OF AN AIRCRAFT EXHAUST PARTICULATE MEASUREMENT TECHNIQUE

W.S. BRESOWAR, U.S. Air Force, Aero Propulsion Lab., *Dayton, Ohio* 45433 (DF456600)

The objective of this program is as follows: (a) define the nature of particulate emissions from aircraft gas turbines operating at a wide spectrum of power levels. (b) determine the relationships between exhaust visibility and particulate concentration, nature, size distribution and agglomeration rate. (c) obtain all necessary particulate data which will allow associate investigators to determine health hazard potential from this cause.

The approach would involve the following steps: (a) literature search, interagency coordination (with Navy, EPA, NASA, Bureau of Mines, Industry). (b) obtain a representative engine at AFAPL and install appropriate particulate measurement systems in an AFAPL test cell. Smoke and gaseous emissions would also be measured. (c) conduct experiments with respect to 1(a), 1(b), and 1(c), above. (d) establish environmental/health studies. (e) repeat experimental procedures on another engine if this appears necessary. Note that considerable effort (engine run time) will be required to obtain reliable data.

Supporting agency address information: AF Aero-Propulsion Laboratory SFF, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0039, INVESTIGATION OF LIGHTNING INDUCED VOLTAGE LEVELS ON AN F104 AIRCRAFT

L.M. LORTON, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF135640)

There is serious concern about the ability of state-of-the-art aircraft electronic systems to survive in a lightning strike environment. Of particular concern is the effect of lightning on composite aircraft with all electrical flight control systems. A test has been developed for predicting lightning induced voltage levels in aircraft. It is a relatively inexpensive, nondestructive test that can lead to significant cost savings in the design of lightning protection for new aircraft systems. The objective of this program will be to determine the accuracy with which this test can predict lightning induced voltage levels.

The PTS transient analyzer will be used to perform the test on an F104 aircraft. The test will be duplicated at much higher current levels using the PTS Marx Generator. The results will then be compared to see if a linear scaling factor exists between the Marx data and the transient analyzer data. Any inclement weather will create delays in the Marx testing. The taking of accurate measurements in the presence of the strong electric and magnetic fields which accompany the firing of the Marx could pose some interesting technical problems.

Supporting agency address information: AF Flight Dynamics Laboratory PTS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0040, MILITARY AIRCRAFT LANDING GEAR PERFORMANCE ON SOIL - TURNING AND MULTIPASS OPERATION

D.C. KRAFT, Univ. of Dayton, Research Institute, *Dayton, Ohio* 45409 (DF128310; F33615-73-C-3023)

Presently military aircraft initial and operating costs are often excessive and aircraft performance is significantly limited because aircraft design and performance criteria for operation on rough, austere soil surfaced air fields is incomplete and unreliable. The objective of this work unit is to develop initial design criteria for aircraft turning operation on soil and realistic prediction of the number of aircraft operations possible from soil surfaces. This criteria will provide a new unique tool for establishing realistic requirements for aircraft operation on soil surfaces and improve the reliability of these aircraft. In addition, a basis will be available to establish the capability of existing aircraft to operate on soil. Thereby a means will be provided to reduce maintenance costs incurred by operation on surfaces which would result in excessive damage to or immobility of the aircraft.

Existing empirical data and previously developed initial concepts will be reviewed, and new improved prediction techniques will be developed using both semi-analytical and analytical approaches. Finite element and high speed computer techniques utilizing appropriate elastic/plastic soil yield criteria will be applied in the analytical approach. Laboratory and field tests will be run to validate initial criteria. Then, an RMI and design criteria will be established which will predict aircraft surface drag and loads, and soil surface rutting during aircraft initial and multipass operation at various speeds and during turns on soil surfaces.

Supporting agency address information: AF Flight Dynamics Laboratory FEM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0041, HELICOPTER TRANSMISSION CONDITION ASSESSMENT

D. BOARD, Boeing Company, *Philadelphia, Pennsylvania* 19142 (DA0D3981; DAAJ02-75-C-0021)

The objective of this program is to obtain the necessary correlations concerning vibration signatures and component condition by collecting and analyzing appropriate data from CH-47C transmissions as returned for overhaul.

In order to assess whether a true correlation does exist between vibration signature, oil debris and mechanical condition, the following six task program will be conducted: Task I - Preoverhaul testing and analysis. Task II - Teardown engineering evaluation. Task III - Post- overhaul testing. Task IV - Oil filter removal and cleaning. Task V - Oil filter debris analysis and correlation with teardown results. Task VI - Correlation of vibration signals and oil analysis with mechanical condition.

Supporting agency address information: AVSCOM Air Mobility Research and Development Laboratory, Eustis Directorate, Ft. Eustis, Va 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0042, CANOPY GLINT EVALUATION PROCEDURE AND DISPLAY STANDARD

D. GUNDLING, Boeing Company, *Philadelphia, Pennsylvania* 19142 (DA0D3979; DAAJ02-75-C-0016)

The purpose of this program is to define a standard test procedure for determining an aircraft canopy sun glint signature of competing canopy devices.

The approach will be to develop a laboratory technique that will display, in terms of a projection, sun glint as a function of sun, aircraft, and observer location. This will be used to develop and validate a generalized glint analysis procedure.

Supporting agency address information: AVSCOM Air Mobility Research and Development Laboratory, Eustis Directorate, Ft. Eustis, Va 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0043, DEVELOPMENT OF A COMPREHENSIVE RDT AND E PROGRAM FOR AIRCRAFT GROUND SUPPORT EQUIPMENT

R. CAHALL, U.S. Navy, Air Engineering Center, *Philadelphia, Pennsylvania* 19112 (DN133406)

To develop a systematized RDT/E program which will define and integrate future ground support requirements with a comprehensive RDT/E effort insuring an optimal operational support capability for future generation aircraft and weapons systems.

Develop a detailed identification of the testing, servicing, maintenance, and handling functions necessary to support aircraft and associated directives, along with organizational structure for the planning and managing of GSE RDT/E. Develop and implement systematic measures to insure prompt consideration of ground support equipment requirements which may be introduced by advancements in airborne systems, changes in support technology, or changes in the operational environment. Develop a long range plan for GSE RDT/E to parallel aircraft systems and technology forecasts.

Supporting agency address information: Naval Air Systems Command (AIR-340E), Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0044, ENGINE APPLICATIONS FOR GROUND SUPPORT EQUIPMENT

W. WOMER, U.S. Navy, Air Engineering Center, *Philadelphia, Pennsylvania* 19112 (DN496004)

To investigate and select an optimal prime mover for application to ground support equipment.

Review current applications of all GSE prime movers. Develop the technical criteria/parameters for an optimum GSE prime mover. Conduct a state-of-the-art engine study and explore in detail the compatibility, performance, pollutant emissions, vibration, and other pertinent characteristics of screened candidate prime movers through application to selected pieces of GSE. Make a physical engine unit determination for each candidate GSE unit. Prepare and conduct a test program to evaluate the candidate prime movers.

Supporting agency address information: Naval Air Systems Command 340E, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0045, PREPARATION OF ASPHALT CONCRETE USING CORAL AGGREGATE

G.M. YOGANANDAM, Ceylonese Dept. of Highways, *Ratmalana, Republic of Sri Lanka* (115903 (HRB NO.))

Laboratory and Pilot investigations are being made of Marshall type mix (using coral aggregate) for use in airfield pavements. /IRF/

Document provided to S.S.I.E. by the H.R.I.S.

SUPPORTED BY Republic of Sri Lanka Govt. - Colombo

1.0046, FASTLODS UPDATE FOR WEIGHT DATA AND FINITE ELEMENT TECHNIQUES

A.L. CURRY, Ling Temco Vought Incorporated, *Dallas, Texas* (DF133500; F33615-75-C-3014)

Techniques have been developed to predict, by theoretical means, structural load distributions for fighter aircraft design flight conditions. The blending of new methods with important existing methods has resulted in the fighter aircraft structural loads program (FASTLODS). The requirements of the MIL-A-008860 (USAF) series specifications provide the basis for this program. Computer programs were developed for the above methods and were grouped to form modules according to their intended usage. Thus, the overall objective of this project is to develop a procedural method to determine design loads for wings, tails, and the fuselage of fighter aircraft, based only on the minimum data available during preliminary design and the appropriate design specifications.

This program shall develop prediction methods for (1) weight slice data computer programs for FASTLODS and (2) FASTLODS update to obtain loads output compatible with structural finite element analysis techniques. The prediction techniques developed will establish a base into which future improvements can be incorporated as additional systems data and experience become available to upgrade their accuracy. The techniques will be functional and apply to the needs of the airframe designer. Analytical methods and experimental data will be employed to accomplish the objective.

Supporting agency address information: AF Flight Dynamics Laboratory FBE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0047, AFFDL-TGF HALF-SPAN MODEL SYSTEM DEVELOPMENT

G. KLEIN, General Dynamics Corporation, *Fort Worth, Texas* 76101 (DF132490; F33615-74-C-3085)

The evaluation of high risk, high payoff advanced aircraft maneuvering technologies is not possible theoretically and extremely expensive experimentally. The development of a half-span model test system for the AFFDL trisonic gasdynamics facility will provide a tool that can be used to experimentally evaluate advanced technologies in a timely and economical manner, thus providing a significant cost savings. The model system will provide a significant tool for improving aircraft combat capability through improved aerodynamic characteristics.

The objective will be achieved through a development contract for the model system hardware and associated equipment. Acceptance testing will be accomplished in the AFFDL trisonic gasdynamics facility.

Supporting agency address information: AF Flight Dynamics Laboratory FXM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0048, AEROELASTIC TAILORING OF ADVANCED COMPOSITE STRUCTURES FOR MILITARY AIRCRAFT

R.W. LYNCH, General Dynamics Corporation, *Fort Worth, Texas* 76101 (DF133890; F33615-75-C-3061)

The overall objective of this program is to determine designs of superior flight-worthy wings whose payoffs are derived by applying aeroelastic-strength tailoring techniques to composite wing structures. Improvements would be derived by a reduction in structural weight penalty required for prevention of unwanted aeroelastic phenomena (flutter, divergence, control reversal, etc.) and maximizing selected beneficial aeroelastic effects (maneuver load relief, increased flexible/rigid lift, etc.). This should result in payoffs such as thinner, higher performance wings and wings with beneficial characteristics that cannot be achieved from metal wing designs. Design for cost will also be investigated.

This program will define the areas where aeroelastic-strength tailoring of composite lifting surfaces can provide improved performance and related cost benefits, develop designs wherein aeroelastic-strength tailoring is applied and payoffs identified, and define or outline a model ground and wind tunnel test validation program. This program will proceed in the following manner. A wing aeroelastic-strength synthesis procedure will be provided, with a minimum computer program development, to carry out evaluation studies on aircraft configurations that will be selected. An evaluation of the benefits of aeroelastic-strength tailoring will be conducted, and the most promising wing designs will be developed based on payoffs attributable to aeroelastic-strength tailoring concepts and considering reliability and cost effectiveness. A model ground and wind tunnel test program will be defined to validate the predicted payoffs.

Supporting agency address information: AF Flight Dynamics Laboratory FYS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0049, VARIABLE CAMBER SYSTEM SUPERCRITICAL WING

R. MCANALLY, General Dynamics Corporation, *Fort Worth, Texas* 76101 (DF133480; F33615-75-C-3018)

Increasing emphasis on acquisition and operations cost reduction requires the development of increasingly efficient Air Force flight vehicles. The overall strategic capabilities of the Air Force can be increased with improvements in the performance of these aircraft. The variable camber supercritical wing (VCSCW) possesses outstanding potential for increasing the performance, reliability, and efficiency of advanced aircraft. However, this development of a viable structural and mechanical design for the flexible skin leading and trailing edges is a major effort required for the eventual incorporation of this concept into basic wing design technology.

This program is an analytical effort to develop several preliminary structural/mechanical designs for the flexible skin leading and trailing edges of a variable camber supercritical wing. Preliminary analysis will include internal loads, mechanical linkages, aeroelastics, weight and cost analysis. A preliminary plan and cost will be recommended for a program to complete the effort through testing.

Supporting agency address information: AF Flight Dynamics Laboratory FBS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, HARDENED VIOLET RESPONSE SILICON SOLAR CELL FOR SATELLITE APPLICATIONS

P. ILLS, Globe Union Incorporated, *El Monte, California* 91731 (DF456370; F33615-73-C-2073)

To develop space qualified hardened violet response silicon solar cells of 14 percent efficiency. Light reflections from principal surfaces will be minimized. Demonstration of welded interconnections are a part of the space qualification.

The present violet response solar cells will be developed with aluminum substituted for silver contacts. Solderless connectors will be applied to both conventional and hardened violet cells. Radiation and space qualification tests will be conducted on resultant cells.

Supporting agency address information: AF Aero-Propulsion Laboratory POE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

2.0002, STUDY FOR APPLICATION OF THE HELIOSCOPE EXPERIMENT IN THE SPACELAB/SHUTTLE MISSION

H. ZIRIN, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (NAS 5-20997; 356-64-38)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0003, APOLLO SOYUZ TEST PROJECT, EARTH OBSERVATIONS AND PHOTOGRAPHY (EXPERIMENT M-136)

F. ELBAZ, Smithsonian Institution, *Washington, District of Columbia* 20560 (NAS9-13831; 174160)

Management and implementation of 'Earth Observations and Photography on the Apollo Soyuz Test Project. The Principal Investigator is charged with 1) training of the astronauts, 2) planning of the scientific aspects of the mission, 3) selection of photographic equipment and onboard support data, 4) realtime support of the mission, and 5) preparation of a preliminary science report after the mission.

The fields of study which the Principal Investigator is to manage include geology, oceanography, deserts, hydrology, and meteorology. The Principal Investigator is responsible for the total program and he has assisting him co-investigators representing universities and research centers in the U.S. and abroad.

This experiment will utilize the knowledge gained from orbital observations and photography of the Moon on the Apollo missions, and of the Earth on the Skylab missions. It is tailored to the maximum use of the capabilities of trained crewmen to study the Earth from orbital attitudes.

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0004, EXPERIMENTAL DETERMINATION OF ROCKET INJECTOR RESPONSE FACTORS UNDER REACTIVE CONDITIONS

B.T. ZINN, Georgia Inst. of Technology, School of Aerospace Engin., *Atlanta, Georgia* 30332 (NSG 3052; 506-21-53)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0005, SPACECRAFT CHARGING NUMERICAL THEORY

A.G. RUBIN, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF246180)

AF function - AF satellite systems operate at synchronous altitudes where charging can occur due to natural causes and may give rise to effects deleterious to the systems. Deficiency - the plasma physics interactions responsible for spececraft charging are not well understood at present and it is necessary to develop approximate models in order to obtain this understanding. Objective FY76 - develop computer code which describes the effect of energetic particle fluxes on the spacecraft charging process for conditions of spacecraft at synchronous altitude. Simulate ambient plasma as well as particle streams and secondary electrons and photoelectrons. How research contributes - this research will apply the powerful techniques of numerical simulation of plasma to the systems problem of satellite blackout due to charging and breakdown. These techniques can handle analytically intractable problems involving ambient plasma beams, secondary effects, and the effects of plasma instabilities.

A one-dimensional spherically symmetric code is being developed using a numerical simulation model. The motion of several thousand particles in the field of the spacecraft and their self-consistent field is followed.

Supporting agency address information: AF Cambridge Research Laboratories PH, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

2.0006, STUDY FOR APPLICATION OF A SOUNDING ROCKET EXPERIMENT TO SPACELAB/SHUTTLE MISSION

A.D. CODE, Univ. of Wisconsin, School of Letters, *Madison, Wisconsin* 53706 (NAS 5-20973; 356-64-41)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, THEORETICAL INVESTIGATION OF ANOMALOUS PROPERTIES OF BCC TI, ZR AND HF ALLOYS 11286 MC

D. DEFONTAINE, Univ. of California, School of Engineering, *Los Angeles, California* 90024 (DA0D9113; DAHC04-74-G-0183)

To examine the anomalous behavior of the first order beta to omega phase transition, the diffusional properties, and the large internal friction peak in BeC Ti, Zr, and Hf metals and alloys. The proposed research is directly relevant to several current programs at AMMRC which are ckncerned with the omega-phase and the diffusion of alloying elements in titanium. Both zirconium and titanium are susceptible tk embrittlement and cracking when the omega-phase is present, a characteristic which limits their use. Titanium is used in the Army for mortar base plates, aircraft, personnel armor. Zirconium alloys are used in nuclear reactors, where cracking and the diffusion of alloying elements or impurities are exceedingly important.

The program will include, but will not be limited to, the following topics: 1) development of a model of the linear defect structure, either analytically by analogy with the linear chain using ferromagnet, or by Monte Carlo simulation; 2) determination of the dependence of the model of the defect structure on temperature and the energies of formation and motion of linear defects; 3) development of a model which describes the diffusion of impurities; 4) evaluation of the models by X- ray diffraction and diffusion experiments.

Supporting agency address information: OCRD Army Research Office, Box CM, Duke Station, Durham, NC 27706

SUPPORTED BY U.S. Dept. of Defense - Army

3.0002, ABSOLUTE RATE CONSTANTS FOR COMBUSTION REACTIONS INVOLVING FREE RADICALS

D.M. GOLDEN, Stanford Research Institute, *Menlo Park, California* 94025 (DF032650; F44620-71-C-0103)

Future AF flight operations will exploit the technologies of propulsion and power. To improve future AF weapons delivery systems, a fundamental understanding of the dynamics and thermochemistry of key reactions in the energy transfer processes of combustion, pyrolysis and nonequilibrium gas dynamics is essential. The recent development of the technique called very low pressure pyrolysis (VLPP) has made it possible to determine the absolute rate constants for fast elementary gas phase radical-radical, radical-molecule and molecule-molecule reactions. This research uses VLPP to study radical processes important in combustion, oxidation and pyrolysis. Included will be quantitative determination of the rate constants for alkane pyrolysis processes and for combination and disproportionation of various organic free radicals such as tertiary butyl, isopropyl, and ethyl as well as for their reactions with oxygen. Heterogeneous reactions of alkyl radicals with the reactor surfaces will also be studied to insure complete accuracy of the measured rate constants. In addition to determining absolute rate constants of radical reactions and their temperature dependence, standard heats of formations, entropies and bond dissociation energies for the radicals will be determined.

Supporting agency address information: AF Office of Scientific Research NC, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0003, INFLUENCE OF METALS ON TUNGSTEN SURFACES

G.M. POUND, Stanford University, School of Engineering, *Palo Alto, California* 94305 (NSG 2071; 506-25-32)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0004, INVESTIGATION OF DROPLET BURNING AT ZERO G

F.A. WILLIAMS, Univ. of California, School of Engineering, *San Diego, California* 92038 (NSG 3047; 750-01-51)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0005, SYNTHESIS CHARACTERIZATION AND PROCESSING OF BISMALEIMIDE RESINS

UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Jose, California* 95114 (NCA 2-75409; 501-21-22)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0006, DEFORMATION AND SOLID SOLUTION STRENGTHENING OF TITANIUM-ALUMINUM SINGLE CRYSTALS

J.C. WILLIAMS, Rockwell International Corp., *Thousand Oaks, California* 91360 (DF033970; F44620-72-C-0043)

Titanium and its alloys have been of considerable interest to the Air Force because of very favorable strength-to-weight characteristics at temperatures from cryogenic up to 800 degrees F, and resistance to attack by many chemicals. Potential applications for skins, structural and engine components of high performance aircraft, cryogenic fuel storage tanks for missiles, and tubing for transporting corrosive fuels all emphasize the available materials roles for titanium alloys. The objective of this research is to further the understanding of the deformation and solid solution strengthening of Ti-Al (alpha-phase) single crystals by determining: (1) the critical resolved shear stresses on the six possible slip systems as a function of Al content and temperature, and (2) the dislocation arrangements and slip behavior as a function of Al content and temperature. This information is required for the successful interpretation of mechanical properties, stress corrosion cracking and texture development of titanium alloys.

Supporting agency address information: AF Office of Scientific Research NE, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0007, FATIGUE CRACK PROPAGATION IN TITANIUM ALLOYS

A.J. MCEVILY, Univ. of Connecticut, School of Engineering, *Storrs, Connecticut* 06268 (DF039080; AF-AFOSR-2703-74)

The safety and reliability of advanced AF aircraft to be built of titanium depends in part on an improved understanding of fatigue crack growth characteristics of titanium alloys. The present program aims at a more definitive determination of the effects of microstructure, mean stress, environment and fracture toughness on the fatigue crack growth characteristics of Ti6Al4V alloy. Special attention will be given to reasons underlying the difference in fatigue behavior of forging and bar stock. Insight will be sought as to the nature of the threshold stress intensity and the factors influencing its magnitude. The quantitative analysis of fatigue crack growth will be advanced. Crack growth will be studied from the threshold level up to rates of one thousandth in/cycle in both air and at one hundred thousandth torr. Several heat treatments will be used to vary microstructure and texture. Fractographic examinations will be made for striations and other modes of separation. Crack growth tests will be run at various mean stress levels for various r values from 0 to 0.5. (r is the ratio of the minimum to the maximum stress level of a loading cycle.)

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0008, BALLOON MATERIAL DEVELOPMENT

G.P. DURNEY, I L C Industries Incorporated, *Dover, Delaware* 19901 (DF240050; F19628-73-C-0155)

AF function - advanced balloon systems (surveillance, reconnaissance, communications, environmental research support, space equipment tests, delivery operations). Deficiency - inability to efficiently and economically evaluate strategic and tactical weapon systems and military reconnaissance, communications and satellite systems. Research - balloon materials, tether cables, instrumentation, ground handling equipment and procedures and test flights to extend payload and/or altitude capabilities. How research contributes - research aids in achieving higher altitudes with heavier payloads for long duration, and in economic evaluation testing of military weapons systems. Improvements in balloon system components increase system performance in areas of altitude, stability, payload weight or duration.

New materials, kevlar for example, new fabrication techniques, triaxial weave for example, and various coating or laminating designs will be investigated. Various fabric characteristics will be determined by series of laboratory tests in an attempt to find optimum fabric for each part of a balloon. Following this selection, a 45,000 cu ft balloon using the optimum materials will be fabricated.

Supporting agency address information: AF Cambridge Research Laboratories LC, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0009, EFFECT OF A THIN DIFFUSED SOLUTE LAYER ON THE NUCLEATION OF FATIGUE CRACKS

I.G. GREENFIELD, Univ. of Delaware, School of Engineering, *Newark, Delaware* 19711 (DF032490; AF-AFOSR-2094-71)

High performance vehicles are needed for weapons delivery, surveillance and logistic support. These vehicles need to reliably perform their missions for maximum lifetime under severe conditions. This can be achieved if the surface of the structures is strengthened and made fatigue resistant. Thus the goal of the proposed investigation is to systematically evaluate the specific changes in material characteristics of the surface and subsurface regions on the dynamics of fatigue crack nucleation and growth. The subsurfaces will be altered by developing a variation of solute concentration. Since the mechanical properties are dependent on solute concentration, the movement and interactions of dislocations and other defects will be revealed. This will be performed for two engineering materials, (1) aluminum with low concentration of magnesium, and (2) titanium-6 aluminum-4 vanadium. Alloys with differing amount of solute will be fatigued and correlated with characteristics of dislocation configurations fracture surface, and surface striations using a scanning microscope. The optimum treatment for each alloy will be determined.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0010, STUDIES RELATED TO MATERIALS FLIGHT SCIENCES

H. LIEBOWITZ, George Washington University, School of Engineering, *Washington, District of Columbia* 20037 (NSG 1155; 506-16-21)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0011, FRICTION AND WEAR VS POLARIZATION OF RUBBING SURFACES

R. COURTEL, Centre Natl. De La Rec. Sci., *Paris, France* (DA0C9359; DAERO 75 G0013)

To study the friction and wear properties of titanium and titanium alloys to determine the influence of and interrelationships between interfacial electrical polarization, alloy composition, crystallographic orientation, surface hardness and superimposed currents. The study will aid in understanding the factors which control friction and wear in metals and provide guidelines for better utilization of titanium alloys or other hexagonal metal alloys in bearing applications.

Utilizing polarotribometric and conventional analytical techniques, the friction and wear (weight loss) of titanium and titanium alloys will be measured as a function of interface polarization and composition. Dry, unlubricated, lubricated, and moist or wet (corrosive) conditions will be utilized. Crystallographic orientation, surface hardness, and superimposed anodic and cathodic potentials will be incorporated to elucidate operative or controlling mechanisms.

Supporting agency address information: AMC Army R&D Group (Europe), Box 15, U. S. Forces FPO, NY 09510

SUPPORTED BY U.S. Dept. of Defense - Army

3.0012, NUMERICAL SOLUTIONS OF NONLINEAR AXIAL MODE INSTABILITY IN SOLID PROPELLANT ROCKET MOTORS

B.T. ZINN, Georgia Inst. of Technology, School of Aerospace Engin., *Atlanta, Georgia* 30332 (DF037600; AF-AFOSR-2588-74)

USAF missile systems must be better designed to eliminate combustion instability. Research will be accomplished on an analytical model capable of predicting the transient behavior of solid-propellant rocket motors during ignition, extinguishment and axial instability. The desired solutions are obtained by simultaneously solving the nonlinear conservation equations that describe the flow field in the combustor and the nozzle, and the unsteady burning of the solid propellant. The flow field in the nozzle is included in the computation so that the nozzle effect is properly accounted for in the analysis. The effect of the burning solid propellant is accounted for by determining the unsteady burning rates at a series of burning stations distributed along the combustor. The equations describing the unsteady combustion process and the unsteady combustor and nozzle flow field are coupled and they must be solved simultaneously. The resulting solutions will be used to determine the combinations of solid rocket engine parameters and propellant parameters that are most susceptible to axial instabilities. This information is expected to improve existing capabilities to design stable solid-propellant rocket motors.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0013, A KINETIC-THEORY APPROACH TO TURBULENT MIXING AND COMBUSTION

P.M. CHUNG, Univ. of Illinois, School of Engineering, *Chicago, Illinois* 60680 (NSG 1150; 505-05-41)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0014, EXPLOSION, DEFLAGRATION AND FRAGMENTATION

R.A. STREHLOW, Univ. of Illinois, Graduate School, *Urbana, Illinois* 61801 (NSG 3056; 506-91-10)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0015, INELASTIC BEHAVIOR OF ADVANCED COMPOSITE MATERIALS (BORON AND GRAPHITE EPOXY)
T. WELLER, Technion, *Haifa, Israel* (NSG 7083; 505-02-42)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0016, STRATOSPHERIC COMPOSITION
R.S. NARCISI, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF244790)

AF function - military operations of the B-1, F-15 and other AF vehicles in the stratosphere. Deficiency - the environmental effects of AF stratospheric operations cannot be predicted because of a lack of knowledge of the normal species concentrations and their spatial and temporal variations. Further, the mixing properties and chemical interactions of jet engine or missile effluents are only poorly defined. Objective - develop the instrumentation, methods and techniques to determine stratospheric gaseous composition, especially minor species, and conduct an initial stratospheric sample collection program. How research contibutes - the composition data is absolutely essential for the development of environmental impact assessment models which will aid the Air Force in establishing stratospheric standards and criteria.

Stratospheric air samples will be obtained at various latitudes and altitudes utilizing cryogenic whole air samplers installed on balloons and aircraft. The gas samples will be retrieved and quantitative laboratory analysis of the gaseous composition will be made with a gas chromatograph, mass spectrometer and a detector for nitrogen oxides.

Supporting agency address information: AF Cambridge Research Laboratories LK, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0017, REFRACTIVE PROPERTIES OF DIELECTRICS AND SEMICONDUCTORS
C.A. PITHA, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF245160)

AF function - tactical warfare. Deficiency - the incorporation of high power laser systems in aerospace vehicles requires a good aerodynamic interface between the interior and exterior of the vehicle. This interface must be capable of distortionless transmission of laser energy. Objective - to specify the parameters for material composition, growth, doping, fabrication technology, and surface preparation needed to provide laser windows for Air Force requirements. How research contributes - provides the logical scientific basis for technical decisions needed to achieve a highly-transparent, distortion-free, strong laser window for several laser wavelength regimes.

Several classes of materials (e.g. Alkali halides, alkaline-earth halides and semiconductors) are measured to determine optical properties which play an important role in controlling distortion in transmission of high power laser radiation through laser windows. These properties include refractive index, temperature dependence of refractive index, absolute and relative values of piezo-optic constants and refractive index and dielectric constant of optical films and coatings. Measurement of these properties is achieved by design, construction and use of IR refractometers, stress-optic instrumentation and ellipsometry.

Supporting agency address information: AF Cambridge Research Laboratories LQ, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0018, INFRARED PROPERTIES OF NEARLY TRANSPARENT SOLIDS
L.H. SKOLNIK, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF245150)

AF function - tactical warfare. Deficiency - the incorporation of high power laser systems in aerospace vehicles requires a good aerodynamic interface between the interior and exterior of the vehicle. this interface must be capable of distortionless transmission of laser energy. Objective - to specify the parameters for material composition, growth, doping, fabrication technology, and surface preparation needed to provide laser windows for Air Force requirements. How research contributes - provides the logical scientific basis for technical decisions needed to achieve a highly-transparent, distortion-free, strong laser window for several laser wavelength regimes.

A variety of materials, prepared in selected ways are measured for performance under high power laser radiation conditions. The parameters determined under the work unit are absorption, thermal conductivity characteristics, and temperature dependence of refractive index. The laboratory measurements include laser Doppler interferometry, emissivity studies, thermal imaging of windows in near and far IR regimes and measurement of thermally-generated window geometry changes under low-power laser illumination.

Supporting agency address information: AF Cambridge Research Laboratories LQ, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0019, DIRECTIONAL SOLIDIFICATION OF GAMMA/GAMMA PRIME-DELTA IN SITU COMPOSITES
M.C. FLEMINGS, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (NSG 3046; 505-01-11)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0020, SPECIAL FINITE ELEMENTS FOR THE ANALYSIS OF FLAW GROWTH AND FRACTURE IN FIBER COMPOSITES
F.G. MCGARRY, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (NSG 3044; 506-17-14)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0021, FINITE ELEMENT APPLICATIONS TO USAF STRUCTURAL INTEGRITY PROBLEMS
T.H. PIAN, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (DF131220; F33615-74-C-3063)

Structural safety of current and future USAF tactical and strategic aircraft is a continuing problem. In order to establish compliance with requirements for residual strength and safe crack growth, analyses of cracked complex structural geometries will be performed. These analyses are necessary to insure increased safety and more cost effective operation of future USAF aircraft.

A special finite element containing an embedded crack will be used in the analyses to determine the variation in stress intensity with crack length for various geometries, loading conditions and materials. The stress intensity solutions shall be presented in tabular and/or graphical format useful to designers and analysts.

Supporting agency address information: AF Flight Dynamics Laboratory FBE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0022, CRITICAL POTENTIALS FOR STRESS-CORROSION CRACKING 11266-MC
H.H. UHLIG, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (DA0D9118; DAHC04-74-C-0026)

To precisely determine the critical potential for the stress-corrosion cracking of a specific alloy in a specific environment. The stress-corrosion cracking of structural alloys continues to cause monetary waste and tactical hazard for the Army. The alloys that are to be investigated are much used in aircraft and terrestrial vehicles, so that knowledge of the conditions under which they are susceptible to stress-corrosion cracking should promptly be of practical value.

The research is to include, but will not be limited to, the measurement of such potentials for representative alloys of aluminum, of titanium, and of copper, in boiling MgC1 sub 2 solution, as affected by temperature, pH, and extraneous anions. As time permits, the work may be extended to include the effects of cold work, heat-treatment, and composition of the alloy.

Supporting agency address information: OCRD Army Research Office, Box CM, Duke Station, Durham, NC 27706

SUPPORTED BY U.S. Dept. of Defense - Army

3.0023, STRUCTURE AND MORPHOLOGY OF GRAIN BOUNDARIES AND INTERPHASE INTERFACES

G.H. BISHOP, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0D4762)

To support the development of improved materials for the Army by determining the factors influencing the structure and morphology of grain boundaries and interphase interfaces and to relate interface structure and morphology to important properties such as ballistic resistance, room and high temperature strength and fatique behavior.

Coincidence theory and computer simulation will be used to calculate the structure and properties of grain boundaries and interphase boundaries. Boundaries of particular interest include the grain boundaries between the Widmanstatten plates in alpha-titanium alloys, twist boundaries in cubic and hexagonal metals, and the martensite-austenite interphase interface in steels. Properties of interest include the thermodynamic properties of energy entropy and free volume and the strength of the interface in slip and fracture. Computer simulation of these and similar interfaces and of interface-related phenomena will be conducted.

Supporting agency address information: AMC Materials & Mechanics Res Center, Watertown, Ma. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

3.0024, RARE EARTH COBALT MAGNETS WITH IMPROVED MECHANICAL CHARACTERISTICS

D.R. CHIPMAN, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0E4786)

Samarium-cobalt magnets which exhibit a large energy product and a high coercive force are hard, strong and brittle. They generally fracture at low stress along existing internal cracks which arise either during pressing and sintering (lamination cracks) or during rapid cooling (due to the anisotropy of thermal expansion). The objective of this program is to enhance the toughness, and thereby raise the fracture strength of these materials.

A conventional method for increasing toughness of a brittle material is the dispersion of softer ductile particles through the matrix to blunt crack growth. Both zinc and lead have been used successfully to increase the toughness of powder metallography samarium- cobalt-5 magnets by precoating the cracks. In the present work, group IB, IIB and IIIA metals will be alloyed in small amounts with Sm and Co, and precipitated as a ductile metallic or intermetallic compound dispersion. Effects of the dispersoid structure, size and properties upon the mechanical and magnetic picture, size and properties upon the properties of the samarium-cobalt-5 will be studied.

Supporting agency address information: AMC Materials & Mechanics Res Ctr ATTN-AMXMR-D, Watertown, Ma. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

3.0025, INVESTIGATION OF THE HOT WIRE PROCESSES FOR WELDING HIGH STRENGTH TITANIUM ALLOYS

W.P. HATCH, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0E4797)

In the development of welding techniques for HY180 steels, it has been reported that some of the best test results were obtained with the hot wire-gas tungsten arc process. It was thought that the improvement might be attributable to cleaning of the wire by resistance heating it in an inert gas shield before depositing it in the weld puddle. The objective of this study is to investigate whether the hot wire approach would provide improvement in welds in high strength titanium alloys of the 6Al-4V, 8M3-8V-2Fe-3Al and 6Al-6V-2Sn types. The project is applicable to joining of smaller forged components to manufacture drive shafts and rotor hubs of the HLH aircraft system.

As part of the FY75 program, it is planned to establish hot wire- gas tungsten arc and hot wire-plasma arc welding capability at AMMRC. This equipment will be adapted for welding titanium and welds made by the hot wire processes will be compared with those made by the more conventional processes. Evaluations will include, but not necessarily be limited to, nondestructive test, metallographic examination and mechanical tests.

Supporting agency address information: AMC Materials & Mechanics Res Ctr Attn AMXMR-ER, Watertown, Ma. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

3.0026, PYROPHORIC BEHAVIOR OF SELECTED METAL ALLOYS FOR AMMUNITION

M. LEVY, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0E4744)

To determine pyrophoricity, fragmentation behavior, chemical and surface effects in metal alloys in HE munitions to increase lethality against armored vehicles and aircraft.

Uranium, titanium, and zirconium alloys will be subjected to simultaneous thermogravimetric TGA and differential thermal DTA analysis up to 2700 degrees F in order to determine their ignition characteristics and to evaluate the mechanism of pyrophoricity in air and oxygen. For selected alloys an examination of fragmentation behavior and the production of fragments for TGA and DTA studies will be carried out in the AMMRC Detonics Testing Facility. Exothermic and endothermic reactions will be correlated with weight changes, reaction products and phase transformations. The effects of alloy composition, heat treatment, hardness, grain size, specimen size and geometry will be explored.

Supporting agency address information: AMC Materials & Mechanics Res. Ctr. AMXMR-EM, Watertown, Ma. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

3.0027, DIFFRACTION STUDIES OF TRANSFORMATIONS IN STEELS AND TITANIUM ALLOYS

C.B. WALKER, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0E4790)

X-ray diffraction techniques will be used to investigate the martensite transformation in relatively simple steels, as a step towards understanding the behavior of complex trip steels, and to investigate t'e omega-phase transformation in alloys of vanadium in titanium. Both materials have many possible Army uses, and the proposed research supports programs to improve them.

The primary experimental approach involves using a computer- controlled diffractometer to measure X-ray diffuse scattering from single crystal specimens through an extended volume of reciprocal space at several temperatures and for several alloy compositions. Auxiliary work includes measurements of integrated intensities of crystalline reflections, plus possible developments of diffraction theory. Measurements probably will be limited to quenched specimens at or below room temperature.

Supporting agency address information: AMC Materials & Mechanics Res Ctr AttN AMXMR-D, Watertown, Ma. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

3.0028, DEVELOPMENT OF AN ACCELERATED CORROSION TEST UTILIZING POLARIZATION RESISTANCE

C.V. ZABIELSKI, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172 (DA0F4730)

To develop an accelerated electrochemical corrosion test which is correlatable with service environments and which is based on the polarization resistance method for the determination of corrosion rates of steel, titanium, and uranium alloys. A new corrosion test is urgently needed which provides immediate data indicative of corrosion performance.

Theoretical work to correct errors in the linear polarization method for corrosion rate determination will be carried out. The specific approach will be to determine corrosion rates from potentiostatic polarization curves. Cathodic and anodic polarization parameters (tafel constants) will be used together with polarization resistance measurements at the corrosion or the natural rest or open circuit potential for corrosion rate determination. A generalized method will also be developed in which a determination of corrosion rates will be made from a detailed analysis of the slope of the potential versus current density curve within a few millivolts of the corrosion or rest potential.

Supporting agency address information: AMC Materials & Mechanics Res. Center, ATTN AMXMR-EM, Watertown, Ma. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

3.0029, EUTECTOID DECOMPOSITION IN TITANIUM ALLOYS

H.I. AARONSON, Michigan Technological Univ., School of Engineering, *Houghton, Michigan* 49931 (DF038240; AF-AFOSR-2595-74)

A rational basis for materials development is required to assure the availability and effective utilization of structural materials in future Air Force systems. The fundamental methodology to provide comprehensive and systematic improvement of existing metallic materials and creation of new materials is dependent upon an understanding of the physical metallurgy of alloys. The objective of this investigation is to deduce the principles underlying the eutectoid decomposition processes in titanium alloys. Specifically, this research will determine why the massive transformation of beta to fully supersaturated alpha occurs in some Ti-X eutectoid systems but not in others, and the ability of the bainite reaction to compete with pearlite formation in hypo-eutectoid and eutectoid alloys. Understanding of these phase transformations is necessary in order to furnish a more substantial base for the development of useful titanium alloys in which these processes play an important role in determining their microstructure and mechanical properties at room and moderately elevated temperatures.

Supporting agency address information: AF Office of Scientific Research NE, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0030, A STUDY OF THE FRACTURE MECHANICS PROPERTIES OF CERAMIC MATERIALS

UNKNOWN, Mississippi St. University, Graduate School, *State College, Mississippi* 39762 (NCA 8-107; 909-54-38)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0031, DAMAGE REPAIR IN COMPOSITES

E.M. WU, Washington University, School of Engineering, *St. Louis, Missouri* 63130 (NSG 1157; 505-02-41)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0032, COMBUSTION CHARACTERISTICS OF HIGH DENSITY FUELS

W.B. BIRK, U.S. Navy, Air Propulsion Test Center, *Trenton, New Jersey* 08641 (DN596809)

Determine the combustion characteristics of high density fuels and compare to those of JP-5 fuels. Define limiting performance of high density fuels in terms of engine limitations (starting capability, combustion stability, etc.). Define combustion system improvements which would permit significant gains in the utilization of high density fuels.

Utilizing various high density fuels and blends thereof, perform tests in a full-scale single combustor rig (t58 combustor) to determine combustion efficiency, stability of combustion and starting capabilities at various air pressures and temperatures and fuel temperatures. Through data analysis, establish overall relationship of maximum BTU content of fuel which can be utilized for any mission, taking into consideration gas turbine engine combustion system limitations and mission operational environment conditions.

Supporting agency address information: Naval Air Systems Command Propulsion Technology Administrator, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0033, CONDUCT A FRACTURE MECHANICS TEST PROGRAM

B. ALECK, Grumman Corporation, *Bethpage, New York* 11714 (DN590040; N00019-75-C-0358)

This program extension will adapt a recently developed concept to extend the usefulness of fracture mechanics testing of thin gage materials. It will be applied to materials presently in use on naval aircraft.

The contractor will quantify the fracture behavior of materials presently in use in aircraft in areas where data do not exist, and will emphasize Ti-6Al-6V-2Sn titanium in the annealed condition and D6Ac steel in thin gages. Attempts will be made to quantify fatigue crack propagation, stable growth, and fracture behavior for quasi-standard specimen geometrics representing more complex airframe applications. Current fracture mechanics analysis parameters will be used to correlate these test results. Spectrum loading effects shall be included. Quality control field flaw detection techniques will be quantified on these specimens.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0034, INTERNATIONAL SYMPOSIUM ON MACROMOLECULES

H.E. MORAWETZ, Polytechnic Inst. of New York, School of Science, *Brooklyn, New York* 11201 (NSG 2060; 501-21-22)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0035, STRUCTURAL CHARACTERIZATION OF HYDROGEN ATTACK

H.H. JOHNSON, Cornell University, School of Engineering, *Ithaca, New York* 14850 (NSG 2078; 505-01-21)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0036, CREEP AND STRESS RUPTURE BEHAVIOR OF OXIDE DISPERSION STRENGTHENED SUPER ALLOYS

J.K. TIEN, Columbia University, School of Engineering, *New York, New York* 10027 (NSG 3050; 505-01-11)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0037, INHIBITION OF HYDROGEN CYANIDE (HCN) EVOLUTION BY COPPER FROM LINEAR POLYURETHANE

H.H. JELLINEK, Clarkson College of Technology, School of Science, *Potsdam, New York* 13676 (NSG 2059; 505-01-31)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0038, HYDROGEN STORAGE AND PURIFICATION SYSTEMS

R.H. WISWALL, Brookhaven Natl. Lab., *Upton, New York* 11973 (DA0L3593; A4062)

The main objective is to evaluate the potential of metal hydrides for use in hydrogen storage and purification. This will be accomplished through study of the composition, equilibrium pressures, heats of reaction and kinetics of various hydrides. This will include not only those metals and alloys known to form hydrides but a search for other alloys which have a higher hydrogen content hydride. Hydrides are promising alternates to cryogenic or high pressure hydrogen storage but higher hydrogen contents are desirable. The information from this project will be valuable in future decisions regarding use of hydrogen as a fuel in military applications. The goals for FY74 are to examine a series of AbC ternary alloys of V, Ta, Ni, Co, Cr, Mo and Cu. Another series of interest are TiAb where a plus b are Fe, Co, Ni, Mu and Cr. At some future date the better hydrides will also be screened for their sensitivity to Co, Co2 and H2O. This latter information is required in evaluation of purification schemes rather than storage.

Experimental techniques are primarily measurement of equilibrium hydrogen pressure with variations in hydrogen content, metal or alloy composition and temperature. Means of predicting possible alloys and their properties is desirable to expedite screening of many candidate systems.

Supporting agency address information: Troscom Mobility Equipment R&D Center, Ft. Belvoir, Va. 22060

SUPPORTED BY U.S. Dept. of Defense - Army

3.0039, STUDY OF FRICTION AND ABRASION OF AIRCRAFT TIRE TREAD MATERIALS

A.N. GENT, Univ. of Akron, School of Arts, *Akron, Ohio* 44304 (NSG 2061; 505-08-31)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0040, MECHANISM OF SUBCRITICAL CRACK GROWTH UNDER SUSTAINED LOAD

D.N. WILLIAMS, Battelle Memorial Institute, *Columbus, Ohio* 43201 (DF040200; AF-AFOSR-2792-75)

The growth of small cracks in structural components to a crack size sufficiently large to cause failure has been a major problem in advanced aircraft systems. It is a problem inherent in high strength materials, and must be more fully understood if successful application of the materials is to be made. Studies of unstable fracture have usually assumed a critical stress intensity below which failure will not occur. However, it is now known that crack growth which will ultimately lead to failure can occur at subcritical stress intensities without the aid of stress corrosion reactions or metallurgical phase changes. The objective of this research is to define the individual contributions of creep resistance and fracture toughness to subcritical crack growth under sustained loading at initial stress intensities less than the critical stress intensity. Such information is required for the determination of toughness (defect tolerance) of structures using fracture mechanics concepts, and is of considerable importance in developing a basic understanding of stress corrosion, fatigue, and brittle fracture mechanisms. Although the investigation will be conducted on a structural aluminum alloy (2024), the problem is not unique to aluminum base alloys, and the research relates to similar problems in steels and titanium alloys.

Supporting agency address information: AF Office of Scientific Research NE, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0041, MECHANISMS OF HIGH TEMPERATURE OXIDATION

H.C. GRAHAM, U.S. Air Force, Aerospace Research Labs., *Dayton, Ohio* (DF213250)

AF function - advanced aerospace vehicles. Deficiency - operating temperature for external skin or turbine engine alloy components are limited to below that where rapid deterioration of the reaction with oxidizing and hot corrosion environments leads to a loss of required physical properties. How research contributes - understanding of the oxidation and accelerated oxidation (hot corrosion) mechanisms will lead to improved alloys to resist these environments.

The reactive behavior of alloys of immediate interest--superalloys and titanium-aluminum intermetallics--will be characterized and the reaction mechanisms established. Measurements of weight change, oxygen consumption, and vaporization rates will be made under controlled thermodynamic conditions. These data will be combined with microstructural analyses and other measurements as needed to determine the oxidation mechanism. The hot corrosion behavior will be similarly evaluated using sprayed sodium sulfate coatings.

Supporting agency address information: Aerospace Research Laboratory II, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0042, POWDER METALLURGY PRODUCTION OF STRUCTURAL SHAPES (PROJECT THEMIS)

A. LAWLEY, Drexel University, School of Engineering, *Philadelphia, Pennsylvania* 19104 (DA0B0341; DAAA25-69-C-0136)

To develop the scientific and engineering principles underlying the production of alloys by powder metallurgy techniques focusing primarily upon the production of fully-dense structural shapes (e.g., bars and sheets) from iron, nickel and titanium base metal powders. This project is intended to advance the state of the art so that improved metal shapes will be available to the military over a broader procurement base at reduced cost.

The overall program will be an integrated sequence of specific topics which are critical in the development of desired properties in powder fabricated products. These topics will include atomization, powder characterization, compaction, deformation, homogenization, development of ductility, development of ultra-fine grain size and production-systems analysis. Iron, nickel, and titanium-base systems were chosen for the study on the basis of a) the wide variety of alloy behavior in these systems, and b) the current alloy interests and problems of DOD in the field of powder fabrication.

Supporting agency address information: ARMCOM Pitman Dunn Research Labs, Frankford, Pa. 19137

SUPPORTED BY U.S. Dept. of Defense - Army

3.0043, MECHANICS OF COMPOSITE MATERIALS WITH DIFFERENT MODULI IN TENSION AND COMPRESSION

R.M. JONES, Southern Methodist University, School of Technology, *Dallas, Texas* 75222 (DF037040; AF-AFOSR-2532-73)

AF flight vehicles will require improved structural Performance and reliability to achieve future mission objectives. Composite materials for air frames, engines, and reentry vehicles are under study by both the research and development communities as a material with structural applications that meet the desired objectives. The objective of this project is the formulation of a material model for composites which accounts for the difference in tensile and compressive moduli and the nonlinear shear stress strain behavior. This model will be applied to sufficient structural problems to demonstrate the properties of the material model. Composite materials that will be considered are ATJ-S graphite, carbon/carbon and graphite/epoxy composites. In addition, asymmetric laminations for plates and shells will be studied. Finally, experiments will be defined which can be used to verify the postulated material model and theoretical response predictions.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0044, THE MECHANICS OF NEAR SURFACE INCLUSIONS AND THEIR EFFECT ON FATIGUE LIFE 10949-MC

P.H. FRANCIS, Southwest Research Institute, *San Antonio, Texas* 78228 (DA0D9076; DAHC04-73-C-0010)

To contribute to the technical knowledge in understanding the effect of near surface inclusions on the fatigue life of high strength material. Fatigue is an important mechanism of failure in many items of hardware such as gun tubes, rotating components of helicopters, and moving components of vehicles.

The research to be performed is to include, but will not be restricted to the following: (1) a selection is to be made from systems such as 4340 steel, aluminum-copper alloys, and/or titanium alloys, which contain various classes of inclusions, in order to characterize the size and configuration of typical inclusions in the material(s), and therefrom, to propose a refined model for initiation of cracks from such inclusions; (2) the chemical composition of the inclusions and of the adhesion characteristics of the inclusion/matrix interface are to be determined; (3) a theoretical determination is to be made of the extent of plastic deformation surrounding a shallow subsurface inclusion; (4) a theoretical analysis of the plastic stress/strain field near a surface inclusion is to be performed.

Supporting agency address information: OCRD Research Office, Durham, NC 27706

SUPPORTED BY U.S. Dept. of Defense - Army

3.0045, HIGH TEMPERATURE OXIDATION AND CORROSION OF IN SITU COMPOSITE ALLOYS

J. STRINGER, Univ. of Liverpool, *Liverpool, England, United Kingdom* (DF214980; AF-AFOSR-2785-75)

AF function - advanced propulsion systems. Deficiency - the behavior of directionally solidified eutectic alloys in high temperature oxidizing environments is not well defined. Research - determination of the oxidation behavior and the interface reactions between phases in various oxidizing environments as a function temperature, phase distribution, and volume fraction strengthening phase. How research contributes - to meet the demands of strength stability at the higher operating temperatures of advanced turbine engines directionally solidified eutectics (in situ composite) alloys are being developed. However, both the compositions and the microstructures of these alloys suggest poorer oxidation resistance than presently used superalloys. Therefore, a quantitative evaluation of their oxidation behavior as a function of composition and microstructure is a prerequisite of a long range development program.

Several oxidation tests will be conducted on in situ composite alloy compositions of technological significance. These tests are (a) oxidation, (b) oxidation following presulfidation, (c) oxidation of salt coated specimen, and (d) oxidation in Dean apparatus with salt being continuously supplied. Complementary studies will be conducted of the reactions at solid/solid and solid/solid/environment interfaces for the pertinent phases.

Supporting agency address information: Aerospace Research Laboratory II, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0046, THE MECHANISM OF STRESS CORROSION FAILURE IN HIGH STRENGTH AL-ZN-MG ALLOYS

P.R. SWANN, Imperial Coll. of Sci. & Tech., *London Sw7 2bp England, United Kingdom* (DA0C9328; DA ERO 124 74 G0033)

To investigate the mechanism of stress corrosion cracking in high strength aluminium alloys by direct observation in the high voltage electron microscope and to determine the hydrogen concentration required to cause the embrittlement. The work is relevant to the Army's need for improved high strength aluminium alloys for armor and other structural applications. Such alloys are currently limited by stress corrosion cracking phenomena.

Specimens exposed to various corrosive environment will be stressed and observed under load and at fracture in the chamber of the high voltage electron microscope. Hydrogen liberation during fracture will be measured by mass spectrometry using a vacuum chamber mounted around the specimen.

Supporting agency address information: OCRD R&D GP Eur., Box 15 FPO NY 09510

SUPPORTED BY U.S. Dept. of Defense - Army

3.0047, EFFECT OF ADHERED SURFACES ON ADHESION

J.P. WIGHTMAN, Virginia Polytechnic Institute, School of Arts, *Blacksburg, Virginia* 24061 (NSG 1124; 505-01-34)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, DETERMINATION OF EXPLORATORY LOADING TECHNIQUES FOR HOLOGRAPHIC NON-DESTRUCTIVE TESTING

A.M. MARTIN, Athens College, Undergraduate School, *Athens, Alabama* 35611 (NAS 8-30880; 502-21-28)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0002, TRANSONIC FLOW STUDIES

UNKNOWN, Univ. of California, Graduate School, *Los Angeles, California* 90024 (NCA 2-90406; 501-06-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0003, SINGULAR PERTURBATION METHODS APPLIED TO THE DYNAMICS AND RHEOLOGY OF SUSPENSIONS 11032-E

I. CHANG, Stanford University, School of Engineering, *Palo Alto, California* 94305 (DA0D9174; DAHC04-73-C-0034)

To conduct theoretical investigations into several fundamental problems pertaining to the dynamics of suspended particles in fluids. Research conducted at TACOM on ferrofluid applications to accelerometer and fluidic components design will benefit from the results of this project. Relevance is also evident due to problems associated with suspended particles in fluids such as in chemical, flame and incendiary agents, or aerosols.

Theoretical investigations will be performed where, 1) the non-linear effect of the fluid is a decisive factor in determining the particles' motion, 2) the inertia of the particles is an important factor, 3) the hydrodynamic couplings between the suspended particles and between particles and the container wall is significant, and 4) the collective motion of an assembly of particles is of interest.

Supporting agency address information: OCRED Army Research Office (ARO-D), Box CM, Duke Station, Durham, NC 27706

SUPPORTED BY U.S. Dept. of Defense - Army

4.0004, INVESTIGATION OF PICTURE STATISTICS AND VIDEO COMPRESSION TECHNIQUES

UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45513; 650-60-10)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0005, INPUT SIGNAL SYNTHESIS FOR LINEAR AND NONLINEAR SYSTEM IDENTIFICATION

H. SORENSON, Univ. of California, School of Engineering, *San Diego, California* 92038 (DF041120; AF-AFOSR-2839-75)

One vital key for achieving required improvements in the performance of complex Air Force systems is the development of new control methods. An important prerequisite for control synthesis is to provide a sufficiently accurate mathematical model for the system to be controlled. Aircraft flight control, jet engine control, and inertial navigation system error modelling are prominent examples of systems for which the modelling problem has been significant. This research proposal addresses improved modelling methods for dynamic systems, and in particular will consider the general problem of input signal synthesis. For known linear systems corrupted by system and sensor noise the state estimation problem is independent of the input. However, when system parameter uncertainties exist, good input signal selection will significantly affect the capability of the estimation procedure to reduce uncertainty. In this work the input vector will be chosen to maximize the Chattacharyya distance subject to energy or magnitude constaints. Initially open loop feedback policies will be studied, but eventually the feedback policy at each stage would be based on all available input data and on the knowledge that future measurements would be obtained. Feedback input signal synthesis algorithms for nonlinear systems will be defined and investigated after the linear system studies, with effort directed toward obtaining analytical insights in this primarily numerical portion of the study.

Supporting agency address information: AF Office of Scientific Research NM, 1400 Wilson Blvd, Arlington, Va 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0006, THEORETICAL INVESTIGATIONS OF FREQUENCY UP-CONVERSION OF INFRARED LASER RADIATION BY DIATOMIC MOLECULES

UNKNOWN, Colorado State University, Graduate School, *Fort Collins, Colorado* 80521 (NCA 2-65503; 506-25-32)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0007, SUPERSONIC FLOW OVER OGIVAL BODIES AT LARGE ANGLES OF ATTACK

H. MCDONALD, United Aircraft Corporation, *Hartford, Connecticut* 06118 (DN590001; N00019-75-C-0097)

The technical objective is to develop a computerized technique capable of predicting the three-dimensional turbulent flow field about sharp nosed bodies at large angles of attack in supersonic flow.

Current inviscid flow theory and three-dimensional boundary layer theory are inadequate for predicting flow over ogival bodies at large angles of attack. Therefore, a special approach (forward marching computer technique) to solving the flow is required which modifies the coordinate system and boundary conditions, to allow computation of the flow field.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0008, OPTICAL SYSTEM FOR DYNAMIC ANALYSIS OF ROTATING STRUCTURES

K. STETSON, United Aircraft Corporation, *Hartford, Connecticut* 06118 (DF457560; F33615-75-C-2013)

The objective of this program is the development and laboratory application of an optical system for performing strain and displacement measurements on rotating structures such as blades and disks. The basis for the optical system is a rotating erector prism which provides continuous motion compensation with respect to the rotating object. Upon development the contractor will use the system to investigate holographic interferometry, speckle photography, and moire interferometry analysis of a rotating blade-disk assembly. The data obtained using these optical techniques will be compared to strain gage results to check both its degree of accuracy and repeatability. Upon demonstrating feasibility and utility of the optical system, a short preliminary study will be carried out to address the problems involved in transitioning the laboratory prototype system to an actual spin pit or test stand optical measurement system.

The overall objective of the program is to develop an optical system for investigating the application of holographic interferometry, speckle photography and moire interferometry for performing dynamic measurements on rotating structures. The program is divided into four phases over a 20-month period including reporting time. Phase I - design study phase; II - erector system development; phase III - applications of systems to rotating objects; and phase IV - problems related to spin pit/engine test stand application.

Supporting agency address information: AF Aero-Propulsion Laboratory TBP, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0009, RAMBURNER INSULATION CONCEPTS AND EVALUATION

N. CHESSIN, Martin Marietta Corporation, *Orlando, Florida* 32805 (DF457090; F33615-75-C-2007)

The objectives of this program are, first, to identify and test innovative, technically sound approaches which would eliminate the need for drilling vent holes in the ablative liner as a solution to the problems caused by external aerodynamic heating and secondly, to optimize a retention scheme for assisting in the retention of the ablator under backside heating conditions or, if technically feasible, the complete elimination of a retention scheme.

The use of vent holes to allow the escape of decomposition gases generated by external aerodynamic heating can hopefully be eliminated by using some new approach such as an external insulator and/or an internal insulation at the elastomer-casing interface. Other innovative but practical approaches for solving this problem should also be considered. The techniques chosen to solve the backside heating problem must be compatible with existing ramjet system requirements, and in addition, the effectiveness of the techniques chosen shall be demonstrated by fabricating and testing these techniques in sub-scale combustors with realistic internal and external aerodynamic and thermodynamic conditions. The minimum number of tests to be conducted shall include four baseline tests, i.e., two combustors without vent holes and two with vent holes, plus one test for each new concept--at least three new insulation concepts shall be evaluated. In-depth thermocouples in the elastomer should be included as part of the test instrumentation for these series of tests.

Supporting agency address information: AF Aero-Propulsion Laboratory RJT, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0010, DEFINE CONCEPTIONAL DESIGN OF AN ON-BOARD OPTICAL PROCESSOR WITH COMPONENTS

J.R. WALSH, Georgia Inst. of Technology, Graduate School, *Atlanta, Georgia* 30332 (NAS 8-31344; 656-23-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0011, MINIMIZING THE DYNAMIC RESPONSE CAUSED BY UNBALANCES IN ROTOR SYSTEMS

C. CUSANO, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

The purpose of this analytical investigation is to minimize the dynamic response, caused by unbalances, of flexible rotors with thin, rigid disks. The distributed mass of the rotor is approximated by lumped masses located at the position of the disks. The gyroscopic moment caused by the disks is included in the analysis and the rotor is assumed to be supported in fluid-film bearings. The problem formulation can be stated as follows: given N disks with specified unbalances, what is the optimum orientation of these unbalances such that the dynamic response caused by these unbalances is minimized.

SUPPORTED BY University of Illinois

4.0012, AN ANALYSIS OF TIME-DEPENDENT TURBULENT WALL LAYERS AND UNSTEADY SEPARATION IN NOMINALLY STEADY FLOW

D.E. ABBOTT, Purdue University, School of Mechanical Engin., *Lafayette, Indiana* 47907 (DF039340; AF-AFOSR-2707-74)

The USAF will require improved aerospace vehicles in the future which will give superior operational capabilities for weapons delivery, interceptor, and reconnaissance missions. In the design of the air intakes, lifting surfaces, and propulsion systems, information is required on drag, heat transfer, and pressure distributions in order to predict and control the air flow. In most cases, the air flow is turbulent over most of the surface and predictive methods used to represent the randomness of the turbulence are only approximate. This analysis removes some of the major approximations involved in other studies. Preliminary results show very good agreement with several different sets of experimental data. The analysis removes the necessity of approximating the Reynolds stresses through the use of the full three-dimensional, time-dependent equations with instantaneous terms including vorticity.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0013, COMPUTATION OF CONE FIELD FLOWS AT LARGE ANGLES OF ATTACK

UNKNOWN, Iowa State University, Graduate School, *Ames, Iowa* 50010 (NCA 2-40503; 502-37-02)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0014, HEAT-TRANSFER INTERACTION

M. KRUMINS, U.S. Navy, Ballistics Department, *Silver Spring, Maryland* 20910 (DN485355)

To determine the increase in the thermal input to a nose tip due to an erosion field encounter.

All possible heat augmentation sources will be considered and evaluated using a theoretical approach to determine if any or all of them are required to account for the heating levels measured in the wind-tunnel tests that have been performed so far. The possible sources of heat are - (1) free-stream turbulence generated by ejected particles, (2) phenomena underlying erosion-related shock wave distortions, (3) unsteady flow phenomena, and (4) shock wave interaction. Once a theoretical model will be available, an experimental test will be defined to validate this model. Finally, the results will be applied to calculate the total recession of nose-tip material during a re-entry flight through an erosive atmosphere.

Supporting agency address information: Naval Ordnance Systems Command, Department of the Navy, Washington, D. C. 20360

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0015, MACH NUMBER EFFECTS STUDIES FOR APPLICATION TO PREDICTION OF FRICTION DRAG AND HEATING OF NAVY MISSILE AND AIRCRAFT

R.E. LEE, U.S. Navy, Aerodynamics Department, *Silver Spring, Maryland* 20910 (DN234548)

To obtain complete and accurate boundary layer profiles, skin- friction and heat-transfer measurements of turbulent boundary layers at a supersonic Mach number of 3 and over a large range of heat-transfer rates and Reynolds numbers. To use the LDV to obtain the turbulent transport properties in this supersonic flow regime.

The nozzle wall of the NOL boundary layer channel is adjusted to create a Mach 3 zero-pressure gradient flow over the flat test plate for studies at different heat-transfer rates and Reynolds numbers.

Supporting agency address information: Naval Air Systems Command AIR-320, Department of the Navy, Washington, D. C. 20360

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0016, BLUNT NOSE-TIP TRANSITION AT HYPERSONIC SPEEDS

D. REDA, U.S. Navy, Ballistics Department, *Silver Spring, Maryland* 20910 (DN485358)

To experimentally investigate transition onset on hemispherically- blunted nose-tip regions of axisymmetric bodies travelling at hypersonic speeds, incorporating a turbulence free facility (free-flight range), with both smooth and rough-wall models, to conduct a parallel analytic study, wherein new correlating methods will be investigated and applied to present and previously published data, resulting in improved prediction techniques (codes) for transition onset and associated turbulent heat-transfer rates.

A systematic study will be conducted using the NOL 1000-foot hyperballistic range, model velocity, nose-tip radius, and range pressure will be selected to ensure transition progression from the afterbody onto the blunt nose-tip. Initial tests will concentrate on parametrically varying model surface roughness and nose-tip radius. Transition onset will be located from surface temperature-time measurements using an optical pyrometer system (model material will be properly selected to ensure the required thermal response, i.e., heating to seeable temperatures without exceeding melt and/or ablation limits). Attempts will be made to correlate all data in terms of appropriate flow-field parameters and model surface conditions.

Supporting agency address information: Naval Ordnance Systems Command, Dept of the Navy (ORD-035), Washington, D. C. 20360

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0017, THREE AXIS ACCELERATION SENSOR

K.S. CHAMPION, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF245900)

AF function - airborne surveillance, target acquisition. Deficiency - atmospheric density variations with time and space cannot be accurately predicted. Research - direct density measurements with satellite-borne accelerometers. Results are correlated with solar and geophysical parameters. How research contributes - permits development of accurate density forecasting techniques. The objective of this work is to develop and fabricate three flyable omnidirectional atmospheric density accelerometer systems and to reduce and analyze the data. The instruments will be flown on future Air Force low altitude satellites. Atmospheric density is determined from measurement of the satellite deceleration caused by aerodynamic drag. It is anticipated that measurements will be made at altitudes from about 130 km to 300 km.

Supporting agency address information: AF Cambridge Research Laboratories LK, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0018, FLUSH MOUNTED STATION-KEEPING ANTENNA STUDIES

P.R. FRANCHI, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF245270)

AF function - navigation. Deficiency or opportunity - present antennas have a height which will cause excessive drag in future high performance aircraft. Objective - to experimentally determine the performance of a simple, dielectric lens over a flat ground plane. To determine whether a second lens, made to fit a curved ground plane will have serious distortion. How research contributes - will lead to a method of reducing the overall height of the aircraft antenna by a factor of about 10..

Far-field-pattern measurements, aperture probing, and impedance measurements will be conducted on an initial simplified model. A second antenna will be constructed and tested to examine the effects of curvature only if the results of the first flat antenna are satisfactory. The experimental antenna will consist of a large outer stationary dielectric with a small inner rotating one to generate a rotating far beam.

Supporting agency address information: AF Cambridge Research Laboratories LZ, L. G. Hanscom AFB, Bedford, Ma. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0019, ACOUSTIC NONDESTRUCTIVE TESTING OF CRITICAL AEROSPACE PARTS

T.L. SZABO, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF245410)

AF function - weapons delivery, strategic and tactical warfare. Deficiency - lack of suitable non-destructive technique for testing aerospace components. Objective - to develop new methods for non- destructive testing using ultrasonic waves. How research contributes - new non-destructive methods will provide quantitative information about part defects and composition for strength and fatigue-life prediction.

Work is underway on a theoretical model that allows the extraction of stress information from phase velocity data. To obtain the necessary depth resolution (1 mil), new high frequency (100 mhz) transduction techniques must be developed. These techniques will also be applied to the generation of acoustic waves on aerospace parts having complex shapes for the accurate characterization of flaw sizes and location.

Supporting agency address information: AF Cambridge Research Laboratories LZ, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0020, VUV ELECTRON DENSITY PROFILER

F. WARD, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF244410)

AF function - communications, radar, navigation, detection, attack assessment. Deficiency - performance of systems employing propagation of electromagnetic radiation. Objective - ionospheric characteristics by knowledge of critical frequencies using a VUV sensor. How research contributes - provides propagation characteristics that enable improved operations. The VUV sensor being developed and tested under this work unit will allow knowledge of critical frequencies to be obtained by this passive technique.

The funding made available by the laboratory director's fund will be used to support the design, fabrication, and launch of a VUV (vacuum ultraviolet) sensor, probably on a defense meteorological satellite (formerly DAPP or DSAP). The sensor will measure VUV radiation both in nadir direction and along the atmospheric limb with a scanning mechanism. Correlation with critical frequency measurements by ground stations will be made. Wavelength bands in the 1350 to 1550 angstrom wavelength region will be utilized.

Supporting agency address information: AF Cambridge Research Laboratories LK, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0021, NAVAL VEHICLE DESIGN AND CONSTRUCTION - SLIDING SURFACE TEMPERATURES

N.H. COOK, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (DN123534; N00014-67-A-0204-0054)

Provide a basic understanding of the thermal interactions which occur at sliding interfaces so that sliding surface temperatures can be accurately predicted.

Experimental measurements will be made of interfacial temperatures and surface profiles. The thermal interaction between the two opposing surfaces is modelled using the surface topography statistics and elastic/plastic asperity models. Heat transfer at and between various contacting asperities is used to predict an average interface temperature. The size, shape, and size distribution of wear particles is being studied with a new device called the ferrograph. The character of subsurface metallurgical changes is monitored by making scanning electron micrographs of sectioned wear tracks.

Supporting agency address information: Office of Naval Research 463, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0022, DIGITAL HOLOGRAPHIC FILTER GENERATION

F.M. INGELS, Mississippi St. University, School of Engineering, *State College, Mississippi* 39762 (NAS 8-31373; 656-23-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0023, PIEZELECTRIC POLYMER STRESS GAGE

P. BURCHAM, Univ. of New Mexico, Graduate School, *Albuquerque, New Mexico* 87106 (DF182550; F29601-74-C-0030)

To perform a preliminary evaluation of a plastic stress gage developed by the Bureau of Standards. The piezoelectric polymer is a thin flat .01 inch thick, 5.5 inches diameter circular shaped disk developed to serve as a general pressure transducer. Due to its physical characteristics the gage may have potential application for use as a stress gage.

The piezoelectric polymer will be evaluated through laboratory tests to include transient loading and unloading from 200 to 3000 psi, establish temperature sensitivity, shock tube tests for 200 to 3000 psi and shear loading at 1000 psi to determine possible cross axis polarization effects.

Supporting agency address information: AF Weapons Laboratory DEX, Kirtland AFB, N. Mex. 87117

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0024, NONLINEAR CIRCUIT SYNTHESIS TECHNIQUES

J. SPINA, U.S. Air Force, Rome Air Development Ctr., *Rome, New York* 13442 (DF736560)

The objective of this effort is to develop design procedures to minimize nonlinear effects in mildly nonlinear circuits. Specifically, design procedures that will reduce nonlinear distortions such as intermodulation, desensitization, gain compression, etc, in amplifier circuits will be explored.

The approach to be used is one that relies on reducing in-band nonlinear distortion products by modifying the first-order transfer functions outside the band of interest. The technique to be used makes use of the fact that certain high-order nonlinear effects in the passband are functions of first-order network parameters at frequencies outside the band, by appropriate modification of these first-order parameters in-band nonlinear effects can be reduced.

Supporting agency address information: Rome Air Development Center RBC, Griffiss AFB, N. Y. 13440

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0025, ELECTRONIC SOLID STATE WIDE ANGLE CAMERA DESIGN

R.J. KELLER, Fairchild Camera & Instr. Corp, *Syosset, New York* 11791 (DF101370; F33615-75-C-1186)

To provide the preliminary design for a high resolution electronic solid state wide angle camera for real time reconnaissance for use in either a remotely piloted vehicle (RPV) in a high threat environment or a high performance aircraft. Camera characteristics include: (1) wide angle coverage, 140 degrees (min), (2) high resolution, 0.5mr or better, (3) low volume, 3/4 cu ft (max), (4) bandwidth, 15 mhz (max), (5) low cost, 20,000 dollars per unit (max) in production quantities of 50 units.

This program consists of a tradeoff analysis and a preliminary systems design. A tradeoff analysis will be conducted with respect to all vital system performance parameters and physical characteristics. These include, but are not limited to, size, resolution, sensitivity, information bandwidth, v/h and cost. The results of the analysis will provide the basis for the system design. The design will incorporate an ultra wide angle lens into a 'pushbroom' scanner with 15,000 CCD elements in the focal plane.

Supporting agency address information: AF Avionics Laboratory RWI, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0026, FREQUENCY SCAN FEED STUDY

R.R. KINSEY, General Electric Company, *Syracuse, New York* 13212 (DF740670; F30602-75-C-0099)

The purpose of this study is to perform analyses and conduct trade- off studies of feed networks and signal processing techniques for large frequency time and phase scanned arrays. The objective is to produce a rational basis for selection of alternatives for possible application in very long range space surveillance/tracking radar systems. The effort will be primarily theoretical and the end product will be a technical report.

Array radars large enough to provide surveillance functions on satellites out to at least synchronous altitudes will be considered. Two different types of feed networks for frequency scanned systems will be examined and compared. Characteristics such as operating and instantaneous bandwidths, costs, flexibility of implementation, etc. are of interest. Analog, digital and hybrid signal processing circuits capable of extracting range, angle and Doppler data from radar returns will be examined in the context of the application. Some system design effort will be necessary to define critical parameters. Emphasis will be on processor costs, reliability, maintainability and waveform flexibility.

Supporting agency address information: Rome Air Development Center OCS, Griffiss AFB, N Y 13440

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0027, INVESTIGATION OF INTERFERENCE FIT FASTENERS USED TO IMPROVE FATIGUE PERFORMANCE OF MILITARY AIRCRAFT STRUCTURES

S.C. FORD, Battelle Memorial Institute, *Columbus, Ohio* 43201 (DF129970; F33615-73-C-3121)

Interference fit fasteners (tapered bolts) are used extensively to improve the fatigue performance of aircraft structures. However, the desired performance is not always obtained and structural failures due to cracks at fastener location have occurred. The objective of this effort is to provide methods of predicting fatigue performance of interference fit fasteners. The results of this effort will provide to airframe engineers reliable techniques and guidelines for designing structures which are fatigue resistant in areas where fasteners must be employed. This will lead to reduced cost over the life cycle of new aircraft systems.

The static strain distribution in the vicinity of an interference fit fastener will be obtained using both analytical and experimental methods. This distribution will be investigated in terms of design and load variables which effect fatigue performance. Changes in the static strain distribution will be measured as a function of the number of externally applied load cycles. These data will be used to determine which features of the strain distribution are related to fatigue performance. Results will be used to derive methods for predicting fatigue performance. Analytical and experimental methods will also be used to investigate fatigue performance degradation when interference fit fasteners are improperly installed. Methods of predicting performance will then be devised. Cyclic fatigue tests will be conducted to test the validity of all prediction methods. Both constant amplitude and spectrum loading tests will be accomplished.

Supporting agency address information: AF Flight Dynamics Laboratory FBR, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0028, PERMANENT MAGNET GENERATOR, 100 KW

A.E. KING, Westinghouse Electric Corp., *Lima, Ohio* 45802 (DA0J3768; DAAK02-71-C-0177)

To determine the applicability of samarium cobalt to generatation. To gain experience and data for possible future use of the rotor is planned for 4Q 74.

Feasibility of the generator at 60,000 rpm, using samarium cobalt magnets, has been established under work unit DA OH 3603. The generator will be designed and built as a two-bearing unit, taking cognizance of advantages and problem areas introduced by the operational speed. Testing will be conducted to verify design calculations and check compatibility with power conditioners.

Supporting agency address information: TROSCOM Mobility Equipment Research and Development Center, Ft. Belvoir, Va 22060

SUPPORTED BY U.S. Dept. of Defense - Army

4.0029, STUDY OF THE HEAT TRANSFER CHARACTERISTICS OF A PCM THERMAL CAPACITOR

UNKNOWN, Tennessee Technological Univ., Graduate School, *Cookeville, Tennessee* 38501 (NCA 8-102; 909-54-02)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0030, PREDICTION TECHNIQUES FOR SUPERSONIC WAKES

J. PARKER, Univ. of Texas, School of Engineering, *Austin, Texas* 78712

Description: Improved prediction techniques for supersonic turbulent and laminar near wakes are under development in this project. Finite difference techniques, using various models for turbulent viscosity, are being utilized to study effects of rotational symmetry, heat transfer and downstream reattachment surfaces. Thus the ultimate prediction scheme will have an extreme range of applicability.

SUPPORTED BY University of Texas

4.0031, DEVELOPMENT OF 400 HERTZ (HZ)/60 HZ CONVERTOR FOR C-141 AIRCRAFT

G.L. FROMME, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF319530)

A letter from AMD/RD, 11 Nov 74, Aeromedical Evacuation Equipment, identified a MAC requirement for a 400 hertz (hz)/60 hz convertor for C- 141 aircraft and authorized a developmental effort to be initiated. The objective of work unit is to provide a portable source of 115 volt, 60 hz a.c. power aboard C-141 aircraft to provide a compatible electrical power for aeromedical equipment. Presently electrically operated medical equipment used on C-141 aeromedical aircraft is confined to equipment which will operate from 28 volt d.c. or 115 volt 400 hz a.c. power. This restriction increases the problems of providing low cost, efficient equipment for aeromedical evacuation flights.

Determine size of convertor required for anticipated electrical loads. Size of convertor will be determined by the starting current of motor operated devices rather than steady state running current in most cases. This will require testing the equipment to determine starting currents. Determine lengths of extension cords, design a storage and carrying case. Write a statement of work for procurement of all items. Perform in-house testing of the total system.

Supporting agency address information: USAF School of Aerospace Medicine NG, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0032, AREA SAFETY MONITORS FOR ROCKET PROPELLANTS

L.J. LUSKUS, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF319410)

This effort provides detection concepts and prototype instrumentation for monitoring extremely hazardous and toxic rocket propellants. Development of area detectors and monitoring devices is urgently needed for the handling, transfer, and sampling of such unique chemicals as the hydrazine homologs and halogen fluorides. The requirement exists both in rocket testing and missile maintenance to provide maximum lead time for donning of protective garments, and to insure a continuous record of occupational exposure. This work supports AFRPL-TN-2109-74-01, and the SAMSO development of a toxic vapor detector for Minuteman III silo maintenance operations.

At the letter request of SAMSO/MNBS, and AFRPL-developed quadrupole mass spectrometer will be evaluated in FY75 for sensitivity and interference in monitoring monomethylhydrazine and nitgrogen tetroxide for Minuteman III application. In FY 76, the spectrometer will be evaluated for detection of other rocket propellants of interest to AFRPL, including mixed amine base and hydrocarbon fuels. The feasibility of using gas phase chemiluminescent methods for low level detection and monitoring of pentaborane and halogen fluoride oxidizers will be investigated as a parallel FY 75-76 development effort.

Supporting agency address information: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0033, DESIGN, CONSTRUCTION AND TESTING OF A RHODAMINE-B OZONESONDE

UNKNOWN, Old Dominion University, Graduate School, *Norfolk, Virginia* 23508 (NSG 6002; 175-61-61)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production And Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, CONTRACT FOR INTEGRATED REAL TIME CONTAMINATION MONITOR

W.E. LUTTGES, Univ. of Alabama, Graduate School, *Huntsville, Alabama* 35807 (NAS 8-31174; 909-54-13)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0002, GEOLOGY AND HYDROLOGY OF SINKHOLES AND SUBSIDENCE ALONG PUBLIC ROADS IN ALABAMA

J.G. NEWTON, U.S. Dept. of the Interior, Geological Survey, *Tuscaloosa, Alabama* 35486 (AL 72-028)

Serious tranportation hazards and costly repairs have resulted from development of sinkholes and subsidence along and beneath public roads. Consequently, there is urgent need for research to locate areas most prone to the development of sinkholes and subsidence; detect problem areas in primary (early) stages; aid in preventing sinkholes and subsidence; and stabilize sites of collapse or subsidence. There is urgent need to define geologic and hydrologic conditions at specific sites to aid engineers in preventing repeated collapses that often occur after repairs.

I) 1. Outline areas (statewide) susceptible to formation of sinkholes and subsidence. 2. Prepare a report illustrating conditions necessary for, and causes of, sinkholes and subsidence as an aid in establishing a basis for evaluating problems and accomplishing other objectives. 3. Establish guidelines for detecting sinks and subsidence in potential highway corridors. 4. Establish guidelines that will define problem areas before subsidence occurs. 5. Obtain readily available records of sinkholes in Alabama and inventory areas of active development. 6. Determine geologic and hydrologic conditions at sites of collapse or subsidence. Monitor and evaluate corrective measures. 7. Evaluate data and prepare a summary report updating all other reports, maps, and findings resulting from the study.

II) 1. Determine dynamic state of the water table in problem areas by means of test holes or observation wells. 2. Geologic mapping (surface and subsurface) to determine stability of area. 3. Use photographs and remote sensing techniques as an aid in early detection of areas prone to sinkhole development and subsidence to be verified by augering. 4. Establish or monitor techniques in stabilizing active sinks through grouting, fill, etc. 5. Contact other state highway departments and other bureaus of the Department of Interior to obtain pertinent information that will aid in fulfilling the mission.

Natural sinkholes were investigated in two areas and man-related sinkholes in five areas. Remote sensing was acquired for seven areas of natural or man-related sinkhole activity. Three county maps showing where sinkhole development has occurred and where it can occur were completed; 16 additional maps are in an advanced stage of completion. (Text Abridged)

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

5.0003, DEVELOPMENT OF VOLUME TABLES FOR PONDEROSA PINE FROM AERIAL PHOTOS

G.S. LEHMAN, Univ. of Arizona, Agricultural Experiment Sta., *Tucson, Arizona* 85721 (0031279; ARZT-2016-4168-022)

OBJECTIVE: Determine the validity of using aerial photos for estimating timber volumes, establishing statistical correlations between field and photo measurements, and developing improved aerial stand volume tables for ponderosa pine.

APPROACH: Two hundred randomly selected ponderosa pine plots in Arizona will be rephotographed at a scale of 1:4800. Tree crown diameter, total tree height and average stand density of all trees appearing on the aerial photo plots will be measured and compared to crown diameter, stem diameter, total height, merchantable height and basal area measurements obtained in the field. Correlations will be used to ascertain which photo measurements will result in the best estimate of gross timber volume. The data will be analyzed by region and site to construct accurate aerial volume tables.

PROGRESS: Photogrammetric investigations were conducted on large scale photos of ponderosa pine forests to determine the feasibility of estimating timber volume by diameter classes. Difficulty had been encountered in making accurate photo measurements in dense stands but it was hoped that the necessary measurements could be obtained in mature ponderosa pine forests where the trees are more scattered. However, even under those conditions, no significant correlations between stem diameter and measureable photographic properties have been determined. The criteria tested included total tree height, crown diameter, canopy density and distance to the nearest trees.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0004, FEASIBILITY OF COHERENT AND INCOHERENT BACKSCATTER EXPERIMENTS FROM THE AMPS LABORATORY

F.R. MOZEL, Univ. of California, School of Letters, *Berkeley, California* 94720 (NAS 8-31346; 356-36-03)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0005, MANAGEMENT OF SUMMER-SEASONAL IRRIGATION WATER IN BEEF COW/CALF AGRICULTURE IN THE SIERRA NEVADA FOOTHILLS

C.A. RAGUSE, Univ. of California, School of Agriculture, *Davis, California* 95616 (B-175-CAL)

Objectives: 1) To determine the current and potential contribution of summer-seasonal irrigation water in cismontane Sierra Nevada foothills to the production of beef calves in California, 2) to suggest alternatives in the management of this water resource in animal-oriented agriculture, based on year-around use of multiple forage types, and 3) to determine methods of reducing consumptive water use in forage plant production and in water distribution systems.

Procedures: The proposed research will be conducted in three phases. Phase 1 will consist of data collection, collation and interpretation. Sources in addition to published literature include data available from the Department of Water Resources of the Resources Agency, State of California, Irrigation Districts Association of California, ERTS-1 and other high and intermediate altitude imagery available from the Remote Sensing Laboratory, UC-Berkeley, and on-the- ground comparative studies of water use efficiency in foothills, with particular emphasis on study sites available at the Sierra Foothill Range Field Station, Browns Valley, Calif. Phase 2 will consist of appropriate field scale and small-plot studies, with emphasis on minimal water use by warm-season forage species, innovations in fertilizer management related to integrated use of winter and summer forages, and modifications of animal-pasture use systems. In Phase 3, information collected during the study will be collected and synthesized into an interpretive simulation and/or linear programming optimization model, with generalization to other systems.

SUPPORTED BY U.S. Dept. of Interior - O.W.R.T.

5.0006, NOX SUPPRESSION POSSIBILITIES FOR GAS TURBINE USING METHANOL AS A FUEL

UNKNOWN, Univ. of Santa Clara, Graduate School, *Santa Clara, California* 95053 (NCA-2-85505; 505-04-11)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0007, ASSESSMENT OF CRITICAL NEEDS OF LAND-USE INVENTORY SYSTEMS

E. MAXWELL, Colorado State University, Agricultural Experiment Sta., *Fort Collins, Colorado* 80521 (0066143; COL00319)

OBJECTIVE: Assess and evaluate (quantitatively) the information needs of forest land-use decision makers. Analyze the applicability of existing and forthcoming inventory systems for supplying the information needs identified under objective number 1.

APPROACH: Documents (such as 'Ecosystem Mapping for Basic Land-Use Planning' by Dennis Lynch and 'Colorado Environmental Data Systems' by CSU's College of Forestry and Natural Resources and people of U.S. Forest Service) will be consulted to obtain an up-to-date compilation of forest land-use inventory needs. The bulk of this effort will then be aimed at quantifying the inventory and information storage requirements necessary to meet these needs. This will include analyses of spatial and temporal resolution, dynamic range, frequency of use and update periods. The information content available from various sources of data will also be analyzed. Investigate the feasibility of using remote sensing (aircraft and satellite) for forest inventories of vegetation type, land forms and snowpack. This will be an extension of recent classification of vegetation type and biomass using ERTS imagery. These information collection methods will be quantitatively compared with more conventional methods.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0008, IDENTIFICATION OF ELECTROMAGNETIC BOUNDARY WAVE EFFECTS ON ROUGH SURFACES

A. JORDAN, U.S. Navy, Research Laboratory, *Washington, District of Columbia* 20390 (DN580043)

The objectives of this study are to extend the present NRL sea clutter model to radars which operate at near grazing incidence with respect to the ocean surface. In particular, shadowing, multipath and electromagnetic boundary wave effects on the sea clutter model will be determined. The possibilities of using these effects to detect changes in sea surface conditions and low-lying objects will be investigated.

For the microwave frequencies under consideration, it will be necessary to consider diffraction and guided mode propagation on the ocean surface in addition to the geometrical optics (ray tracing) calculations. A comprehensive analysis requires consideration of electromagnetic boundary wave propagation in various modes along the nonuniform surface of the sea. These modes will also be studied experimentally using a buoy to measure horizontally and vertically polarized fields at the surface.

Supporting agency address information: Naval Air Systems Command (310-B), Washington, D.C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

5.0009, FISHERY ANALYSIS - NORTH ATLANTIC BLUEFIN TUNA

G.L. BEARDSLEY, U.S. Dept. of Commerce, Miami Fisheries Laboratory, *Miami, Florida* 33149 (SEC-019-77-RF-A-1)

Objectives: a. Develop sufficient understanding of the status of bluefin tuna stocks, and the effects of fishing pressure and environmental forces on the abundance and distribution of the species, for effective conservation and management. b. Develop information on the dynamics and life history of bluefin tuna to permit rational management and just allocation.

Approach: Collect and analyze information on the biology, ecology and population dynamics of bluefin tuna in the North Atlantic to determine status of stocks and recommendations for rational management schemes. Data on catch, effort, size and age of distribution, direct stock counts, distribution and relative abundance will be collected from commercial and sport fisheries, and by remote sensing surveys.

Statistical and biological information will be obtained from the commercial seine fishery by sea-going samplers. Fifty lengths from each set and detailed vessel activity logs will be maintained, and tagging will occur on an opportunity basis. Port samplers will obtain statistical and biological data from the New England sport fishery and the commercial fishery using gear other than purse seines.

Planned Activities (1975): Survey, sort, and identify existing larval collections, and conduct a larval survey cruise. Conduct aerial photography and LLLII surveys. Sample commercial catch for statistical and biological data. Evaluate morphometrics, meristics, biochemical and parasites for stock identification. Compare fluctuations in bluefin tuna abundance, distribution and year class strength to indices of environmental changes.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0010, STUDY OF LASER APPLICATION TO MEASURE VERTICAL SEA TEMPERATURE AND TURBIDITY

J.G. HIRSCHBERG, Univ. of Miami, Graduate School, *Miami, Florida* 33149 (NAS10-8795; 177-22-91)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0011, CLIMATIC AND PHENOLOGICAL POTENTIAL FOR IDAHO AGRICULTURE

D.O. EVERSON, Univ. of Idaho, Agricultural Experiment Sta., *Moscow, Idaho* 83843 (0063231; IDA00669)

OBJECTIVE: Determine patterns, variation and interrelationships between climatic indicators. Associate phenological responses with climatic data. Develop improved statistical relationships between atmospheric and phenological variables of fundamental impact on plant growth and yield. Determine methods to evaluate and utilize remotely sensed data relative to agricultural ecosystems from Earth Resources Technology Satellites (ERTS) and aircraft.

APPROACH: Growing degree days on different bases will be computed for all Idaho locations using daily data and compared to detailed hourly records for adjacent Class I stations. Soil and air temperatures in Southern Idaho will be analyzed to establish norms and interrelationships between these climatic and phenological observations on the purple lilac. Comparison of ERTS-A satellite data and ground phenological observations at six-day intervals throughout the growing season will be made.

PROGRESS: Two stations were set up and observers obtained at Hamer and Helmer, Idaho as parts of the ERTS-A satellite network. Photographs were taken each 6 day interval and sent to Montana State for processing. Soil temperature data from several south Idaho stations were summarized. A phenological map for Idaho was completed. Growing degree days on both a 40 and 50 degree base for the state were completed. Work is in progress on a conditional probability study of the probability of a second frost given that a first fall frost has occurred. This should enable evaluation of the economic potential for frost prevention methods.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0012, SOYBEAN AND CORN INSECTS

D.B. BROERSMA, Purdue University, Agricultural Experiment Sta., *Lafayette, Indiana* 47907 (0032395; IND01657)

OBJECTIVE: Determine: the bionomics of agronomic insects, plant resistance to insect attack, develop potential arthropod controls, possibilities of remote multi-spectral sensing for determining insect populations in agronomic crops.

APPROACH: Economic insects affecting corn and soybeans will be investigated in the field and in environmental chambers for feeding and oviposition habits; ingress, egress and movement within a crop area; and response to environmental factors. Plant resistance to insect attack will be evaluated by behavioral activities of insects and physical and chemical characteristics of plants. Integrated control methods will be used to evaluate potential controls. Correlation of aerial survey by remote sensing with population and damage evaluations will be made.

PROGRESS: Studies of the variation of the makeup of insect populations in soybeans due to weed species present were continued during the summer of 1973. The effects of these insects on the soybeans was studied with damage evidenced particularly to the developing seed, by tarnished plant bug and stink bug. Further study on the potential of aphids, hosted on weeds in or near the soybean field, to vector diseases during exploritory probing and feeding, by a number of aphid species. A survey of soybean insects was taken on Purdue Agronomy Farm in Cooperation with Dr. Marcus Kogan of the Illinois State Natural History Survey, Urbana, Illinois.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0013, REMOTE SENSING OF IOWA'S AGRICULTURAL AND FORESTRY RESOURCES

R.E. CARLSON, Iowa State University, Agricultural Experiment Sta., *Ames, Iowa* 50010 (0064179; IOW01997)

OBJECTIVE: Refine and improve remote sensing - photo interpretation procedures relating to Iowa's natural resources in problems dealing with classification and inventory of agricultural and forest lands and the detection of adverse stresses in these ecosystems.

APPROACH: Standard photo-interpretive procedures and new technology, as available, will be incorporated to extract information from existing and proposed aerial imagery to develop classification schemes to inventory soils, crops, forest land and the extent of diseases in crops and trees at selected test sites in Iowa. It is anticipated that the information extracted at test sites can be extended to areas not physically examined on the ground, but covered by aerial imagery. Basically, we hope to consolidate our expertise from different fields to maximize the information with respect to agriculture available from remote sensors.

PROGRESS: Aerial imagery was obtained over 4 sites during May, Aug., Sept. and Oct. of 73. Due to technical difficulties, some imagery was underexposed and critical evaluation was difficult for some uses. The imagery is being used as follows: Crop types are being inventoried and correlated with ERTS-1 imagery; A portion of the Des Moines River was photographed to determine the impact of subsequent inundation by the Saylorville Dam on forest vegetation; Delineations and boundaries on soil maps prepared using conventional B and C imagery are being evaluated relative to patterns on other types of imagery; A soil association map of Iowa using ERTS-1 imagery as a base is being prepared. Preliminary analysis of multidate imagery indicates that much information can be derived concerning the timing of phenological events for use in identification of vegetation habitat types. Brown stem rot development and distribution were not detectable as the flight period was prescheduled for normal soybean development and weather delayed maturity. The photos were nonetheless needed and used to identify soybean fields and related ground truth data in 1973.

SUPPORTED BY Iowa State Government - Des Moines

5.0014, VIRUS DISEASES OF CORN SORGHUM AND SOYBEANS

J.H. HILL, Iowa State University, Agricultural Experiment Sta., *Ames, Iowa* 50010 (0059040; IOW01878)

OBJECTIVE: Study corn, sorghum, and soybean virus diseases; how they relate to crop production; ultimately to improve control measures of each.

APPROACH: Study virus disease interactions, host ranges, resistance, physiology, biochemistry (automatic amino acid analyzer, etc.), ultrastructure (electron microscopy), purification (analytical ultracentrifuge, etc.), serology, and transmission of the causal viruses.

PROGRESS: Tobacco ringspot virus was identified from Iowa soybean fields in 1971 and 1972. Infrared aerial photography can detect soybean fields infected with the virus and may aid in epidemiological investigations of the disease caused by the virus. Pea roots contained 40-70% as much clover yellow mosaic virus as did tops 10 days after inoculation; the average overall experiments at various times after inoculation was 46%. Roots have lower phenolic content than an equal amount of foliage tissue, and purification from pea roots eliminates one differential cycle which helped minimize viral aggregation and loss. Maize dwarf mosaic virus strain B was purified to apparent homogeneity. Virus prktein migrated as a single component in polyacrylamide gels had a mol. wt. of 36500 estimated by sodium dodecyl sulfate gel electrophoresis but the value was 28500 as determined by amino acid analyses. A total of 264 amino acid residues are present in the protein. The virus contains 6% RNA based on its phosphorous content and the nucleotide composition of its nucleic acid. Maize dwarf mosaic virus replication was demonstrated in several pigment-deficient mutants of corn. Infected plants were symptomless, and presence of the virus was determined by recovery assays on susceptible sweet corn. Of nine mutants tested, six supported replication of the A strain of MDMV, and eight supported replication of the B strain. Etiolated mutants seemed more susceptible to MDMV than those grown in light.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0015, ANALYSIS OF DATA FOR ERTS FOLLOW-ON INVESTIGATION

R. HARALICK, Univ. of Kansas, School of Engineering, *Lawrence, Kansas* 66044 (NAS 5-20943; 641-15-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0016, WHEAT - ITS WATER USE, PRODUCTION, AND DISEASE DETECTION AND PREDICTION

E.T. KANEMASU, Kansas State University, Agricultural Experiment Sta., *Manhattan, Kansas* 66502 (0062202; KAN-05-296)

OBJECTIVE: Evaluate effect of water stress, disease and leaf area on the reflectance characteristics of wheat, evaluate disease losses in terms of yield and water use, and predict disease-severity and economic loss.

APPROACH: The capabilities of NASA's Earth Resources Technology Satellite A will be used to determine the presence of the major wheat diseases of Kansas and evaluate their severity in terms of crop damage. Reflectance data as estimated by satellite imagery will be related to water use.

PROGRESS: Ground-based data collection platforms (DCP) were placed in two commercial wheat fields in Riley County, Kansas. Meteorological information such as maximum and minimum temperature, relative humidity, and hours of free moisture were transmitted to the satellite. These data were incorporated into disease prediction equations that predict the reduction in yield due to disease. The DCP operated with minimal maintenance. Reflectance characteristics of agronomic crops are of major importance in the energy exchanges of a surface. In addition, unique patterns in reflectance may be valuable in remote sensing application. Our study suggests that the ratio of the reflectances of the 545 nm and the 655 nm wavebands provides information above the viewed surface regardless of the crop. The reflectance ratio is less than unity during the early and late part of the growing season. For all crops studied, the ratio closely followed their growth and development. The ratio appeared to be a more desirable index of growth than the near infrared reflectance. The wavelengths involved in the ratio correspond to ERTS-1 MSS 4 and MSS 5.

SUPPORTED BY Kansas State Government - Topeka

5.0017, DESIGN OF UBARI-GHAT ROAD 360 KMS

M. ELREJEBY, Ministry of Communications, *Tripoli, Libya* (115063 (HRB NO.))

The most feasible route through an area of varied topography is being sought by utilization of semi-controlled aerial photography. Controlled aerial photo and contour maps are being prepared and employed in planning the road. Soils and material surveys by air-photo interpretation techniques, together with field and laboratory methods, are used in this study. /IRF/

Document provided to S.S.I.E. by the H.R.I.S.

SUPPORTED BY No Formal Support Reported

5.0018, TUNABLE LASERS FOR WATER VAPOR MEASUREMENTS AND OTHER LIDAR APPLICATIONS

R.W. GAMMON, Univ. of Maryland, School of Arts, *College Park, Maryland* 20740 (NSG 1156; 645-20-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0019, MANAGEMENT AND UTILIZATION OF FOREST RESOURCES IN MASSACHUSETTS

D.R. PROGULSKE, Univ. of Massachusetts, Agricultural Experiment Sta., *Amherst, Massachusetts* 01002 (0066140; MAS00502)

OBJECTIVE: Develop methods by which trees and forest wildlife can be best managed and utilized in response to human needs including lumber and wood fiber production, water production, and recreation.

APPROACH: Study response of tree stands to climatic, edaphic, hydrologic, and social forces. Investigate forest management in relation to their influence on forest tree stands and wildlife habitat. Develop methods for economically removing unutilized trees and slash to improve forest stands. Develop methods and procedures for converting wood fiber into usable products (building products and moulded products). Develop procedures and programs for making decisions relative to forest uses. Inventory forest cover types from aerial photographs to develop base for decisions on use of forests in Massachusetts.

SUPPORTED BY Massachusetts State Government - Boston

5.0020, DEVELOPMENT OF ATMOSPHERIC MODELS

L. JACCHIA, Smithsonian Institution, *Cambridge, Massachusetts* 02138 (SRF 450123)

Atmospheric research using satellite-drag and composition data has been carried out at Smithsonian Astrophysical Observatory (SAO) since 1959. At this time, fundamental information concerning atmospheric structure, density, composition, and variations is being revealed. Instrumented satellites are now providing composition data that will allow the development of accurate and complete models of the atmosphere and its variations.

The five activities planned for the total SAO FY-75 program of Upper Atmospheric Research are outlined below. The SRF grant will primarily be used for computations required for parts A and E below, and will be coordinated with SAO's NASA program: A. Present temperature models are based on the 10.7-cm solar-flux index; new ones will be developed from an extreme-ultraviolet (EUV) index derived from data collected by the Atmospheric Explorer satellite (AE-C) and from satellite drag. B. Models for the departures of composition from the static-diffusion model will be refined. These models will be able to represent variations in composition observed by mass spectrometers on the OGO-6, ESRO-4, and AE-C satellites, temperature variations observed through Doppler monitoring of the 6300 A airglow line on OGO-6, and density determinations from SAO drag data. C. The geomagnetic effect on composition will be determined by comparing number-density measurements from the ESRO-4 satellite with geomagnetic data. D. The rotation of the atmosphere will be deduced by observing the secular decreases in the orbital inclinations of seven satellities. The drag associated with a particular value of rotation is modeled very precisely since these satellites already have effective atmospheric densities determined as a function of time. This work will involve the analysis of satellite-orbit and density data already at SAO. E. The density determinations for FY 1970, 1971, and 1972 have been completed and will be published, while new ones will be made and published for FY 1973 and 1974. Emphasis will be given to the period when the AE-C satellite is making in situ measurements of the EUV flux to be used in correlative analyses.

SUPPORTED BY Smithsonian Institution

5.0021, ATMOSPHERE DENSITY MEASUREMENT BY ROCKETBORNE ELECTRON BEAM TECHNIQUE

UNKNOWN, Tri Con Associates Inc., *Cambridge*, *Massachusetts* (DF243380; F19628-75-C-0124)

AF function - low altitude operational satellites and ballistic nuclear weapon delivery. Deficiency - trajectories of missiles and satellites cannot be precisely calculated. Research - development and testing of an accurate rocket density measuring device. How research contributes - a knowledge of the atmospheric density is necessary for the prediction of the behavior of upper atmosphere military vehicles, and the effect on the environment of nuclear weapon detonations. The objective of this work is to measure atmospheric density from 120 to 160 km using an electron beam bremsstrahlung luminescence technique. This technique can be used to make accurate measurements of atmospheric density in this altitude range.

Atmospheric density will be determined by measuring the rate of production of bremsstrahlung photons created by the interaction of an electron beam with the atmosphere. Large area proportional counter X-ray detectors will be used to make statistically accurate density measurements. The number concentration of molecular nitrogen will be determined from a measurement of the luminescence created by the interaction of the electron beam with the ambient gas. This same luminescence will be measured using dual photometers to determine the path of the electron beam across the interaction volume viewed by the X- ray detectors. Based on a larger similar system built for Aerobee rockets, an electron beam system to make these measurements will be designed, built, and flown on a Paiute rocket. By using a smaller rocket the cost per flight of the rocket, preparation of the system, and launch will be substantially reduced.

Supporting agency address information: AF Cambridge Research Laboratories LK, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0022, EXTENT OF SPITTLEBUG DAMAGE TO RANGE GRASSES AND SUGARCANE IN NORTHERN MEXICO

D. ENKERLIN, Inst. Tecnol. De Estud. Sup., *Monterrey*, *Mexico* (0041246; 7090-10922-002-A)

OBJECTIVE: Determine the species, distribution, and relative importance of spittlebugs infesting rangeland grasses of Northern Mexico. Determine the nature and amount of damage inflicted by spittlebugs to the principal rangeland grasses.

APPROACH: Specimens of the pest complex and the infested host plants will be collected along the Northern gulf coast of Mexico. The effect of the various species of the insect complex on the host and the relative abundance of the insect will be recorded. Aerial infrared photographs will be made of known infested areas and correlated with ground truth data to develop remote sensing survey techniques for the detection of infestations and rate of spread. Dispersal patterns and environmental influences that affect the spread of the insect will be identified.

SUPPORTED BY U.S. Dept. of Agriculture - A.R.S. - S.T.A

5.0023, DEVELOPMENT OF TECHNIQUES IN FOREST BIOMETRY

W.L. MYERS, Michigan State University, Agricultural Experiment Sta., *East Lansing*, *Michigan* 48823 (0063482; MICL01148)

OBJECTIVE: Develop biometrical computer software that emphasizes ease of application. Determine design parameters for sampling Michigan forest resources. Design and test improved methods of forest measurement. Expand technical capabilities for measuring non-timber values of forests.

APPROACH: Computer software development entails extensive systems analysis and programming to adapt existing theory to practical needs. Data bank on statistical characteristics of forest resources requires field sampling, assembling available data, and development of retrieval system. Improved mensurational methods require development and modification of both instrumentation and inventory systems. Exploration of economical parameters to be measured is the most pressing need in measurement of non-timber values.

PROGRESS: A partially computerized storage and retrieval system for personal information files was completed during the reporting period. Effort has been directed toward the use of remotely sensed data from satellites for inventory and analysis of natural resources. Both ERTS-1 and SKYLAB imagery are being processed. Both manual interpretation and computer processing methods are being employed. Preliminary findings indicate that the ERTS imagery is suitable for mapping forest areas that are about 40 acres or more in size. Only very gross distinctions can be made, such as between conifers and hardwoods. SKYLAB camera imagery has better resolution which allows mapping of smaller areas down to about 10 acres in size. Even with the SKYLAB imagery, type distinctions are coarse. Computer compatible tapes from the SKYLAB scanner have not yet become available for analysis. Demonstration of the utility of high altitude color infrared imagery is also being undertaken with Mason County as a test site. Such imagery collected from RB-57 and similar aircraft is proving quite suitable for production of moderately detailed forest type maps useful for many forest management applications. Work has also been done on computer programs for testing in forest biometry courses and analysis of experimental data.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0024, METHODS OF ESTIMATING INSECT ABUNDANCE AND RELATING POPULATION DENSITY TO INSECT DAMAGE

H.C. CHIANG, Univ. of Minnesota, Agricultural Experiment Sta., *St. Paul*, *Minnesota* 55101 (0014293; MIN-17-029)

OBJECTIVE: Develop methods of detecting and quantifying insect populations, and study the effects of insects on crops.

APPROACH: Insects to be studied include phytophagous species (on cabbage, sugar beet, soybean and wheat), and predatory species (ground beetles and lady beetles), both in the field and under controlled laboratory conditions. Methods of detecting insect infestation, such as aerial photography and UV reflection, will be explored. The interaction of phytophagous insects, predatory insects, crop plants, soil microorganisms, and animal manure will be studied. Interdisciplinary and international cooperations are planned wherever they may enhance the studies.

PROGRESS: Continued cooperation with FAO in compiling information on crop loss due to agricultural pests on a world scale. Initiated cooperation with Dr. R. F. Smith of University of California, Berkeley, to compile a bibliography on crop loss due to insects. Cooperated with Dr. M. P. Meyer of College of

Forestry in studying aerial photographs of corn field that had suffered from armyworm defoliation. Cooperated with Dr. A. Okubo of the Johns Hopkins University, analyzing the kinetics of midges in a swarm.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0025, FOREST RESOURCE MANAGEMENT APPLICATIONS OF MEDIUM- TO HIGH-ALTITUDE COLOR INFRARED AERIAL PHOTOGRAPHY

M.P. MEYER, Univ. of Minnesota, Agricultural Experiment Sta., *St. Paul, Minnesota* 55101 (0064373; MIN-19-050)

OBJECTIVE: Improve the efficiency of forest land managers through the determination of the best type and the cost-effectiveness of medium and high altitude infrared color aerial photography for forest resource surveys and forest land management.

APPROACH: A forested area in Northern Minnesota will be photographed using standard forestry aerial photography and various types of smaller scale color infrared aerial photography. Selected forest survey and forest management information needs which can be determined from aerial photographs will be interpreted by locally experienced trained professional forest aerial photo interpreters. The results of the interpretations will be analyzed by statistical means as well as interpreter reaction. At the same time, data on the costs of the two types of aerial photography will be determined. A benefit-cost approach will be used to determine the optimum type of photography for forest survey and management purposes. In addition to the project interpreters, all possible local, on-the-ground, land managers will be given copies of the photography to evaluate in their own terms.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0026, PHYSIOGRAPHIC CLASSIFICATION OF SOUTHERN PINE FOREST LANDS

W.F. MILLER, Mississippi St. University, Agricultural Experiment Sta., *State College, Mississippi* 39762 (0060698; MIS-0606)

OBJECTIVE: Organize physiographic land patterns into a system having significance and utility for resource managers. Develop a physiographic map of southern region using the new system.

APPROACH: Current information on physiography, soils, and surface geology related to forest vegetation will be analyzed and coordinated. Localized information will be reorganized to form a unified regional system. Map development will be on a state basis, utilizing local authorities, aerial photography, and space imagery when appropriate.

PROGRESS: During this period the investigator was asked by the Southern Forest Environment Research Council to investigate the purchase of Earth Resources Technology Satellite imagery for use in physiographic classification of the thirteen Southern states. A suitable data product was determined to be the 9 in. x 9 in. negative format for Bands 5 and 7 (0.6 - 0.7 microns and 0.8 - 1.1 microns), enlarged to a scale of 1:500,000. This selection was based on an actual exercise involving the delineation of physiographic divisions in northwest Alabama and northeast Mississippi. Scales of 1:1,000,000 and 1:250,000 were also tested. It was also determined that the winter season imagery served best for terrain analysis.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0027, APPLICATION OF EREP SATELLITE DATA TO AGRICULTURE AND FORESTRY IN THE MISSISSIPPI DELTA

G.R. TUPPER, Mississippi St. University, Agricultural Research Sta., *Stoneville, Mississippi* 38776 (0063673; MIS-7005)

OBJECTIVE: Study application of EREP data on agronomy crops, grasslands, and forestry. Ground base data which is pertinent to each of these areas will be collected and reduced to computerized form through a data management team which will act as a service group to the entire EREP program. Assist in evaluation of the significant application aspects of resultant data analysis and results of comparison models in collaboration with sample users.

APPROACH: Obtain ground truth measurements in field areas that will be monitored to obtain data on specific schedules coinciding with satellite passage over the respective areas. Fields approximately 50 acres in size containing cotton, corn, rice, soybeans, fallowed soil, hardwood timber, and weed infestations will be monitored. Correlations between data obtained from the ground truth measurements and that obtained from satellite passage will be made.

PROGRESS: A study of the application of EREP data on (1) agronomy crops, (2) grasslands, and (3) forestry are being made. Ground base data pertinent to each of these areas are being taken and reduced to computerized form through a data management team which act as a service group to the EREP program. Evaluation of the application aspects of resultant data analysis and results of comparison models in collaboration with sample users are being made. This study involves information obtained during EREP flights and coordinated with similar data obtained during SKYLAB flights. The Delta Branch Experiment Station, Stoneville, Mississippi, has obtained ground truth measurements in field areas that are monitored on specific schedules coinciding with EREP passage over the respective areas. Fields containing cotton, corn, rice, soybeans, fallow soil, hardwood timber, and weed infestations are being monitored at the Delta Branch Experiment Station and adjoining areas.

SUPPORTED BY Mississippi State Government - Jackson

5.0028, LINEAR PROGRAMMING MODEL FOR AGRICULTURAL LAND USE PLANNING IN NEW JERSEY

L.E. SMALL, Rutgers the State University, Agricultural Experiment Sta., *New Brunswick, New Jersey* 08903 (0064809; NJ00889)

OBJECTIVE: In this research project (Stage I), a linear programming model for maximizing net farm income will be built for one of the regions. The completed model will be tested and modified as necessary. A Stage II research project is contemplated in which the model would be extended to include all of the regions of the state. The final model would then be used as a tool for policy analysis.

APPROACH: Municipality land use data collected by the Extension Service will be evaluated and improved. In conjunction with aerial photographs, soil maps, and data on soil productivity, these land use data will be used to delineate major agricultural production (agro- economic) regions within New Jersey.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0029, ENVIRONMENT TREE VIGOR, BEETLE BIOLOGY IMPACT, DETECTION CONTROL OF DENDROCTONUS ADJUNCTUS

H.G. KINZER, New Mexico State University, Agricultural Experiment Sta., *Las Cruces, New Mexico* 88070 (0066205; NM00016)

OBJECTIVE: To provide basic information on the interrelationships of environmental conditions, tree vigor, and bark beetle biology that will be of value in predicting impact, making previsual detection, making management decisions, and for controlling Dendroctonus adjunctus.

APPROACH: Precise measurements of environmental factors will be made and their effect on tree vigor, determined. Environmental and host factors to be measured include precipitation, ground moisture, air temperature, relative humidity, age, aspect, and basal area. The relationship of tree vigor and impact of beetle attack will be measured under both natural stand conditions and areas where ecological conditions (and thereby tree physiology) are altered by such means as polyethylene ground cover, root pruning and crown thining. Trees in the latter situation will be highly instrumented and manually infested with known numbers of beetles. These instrumented trees will be photographed by airborne infrared photography techniques at intervals following infestation to determine if this method is feasible as a previsual detection method. Various chemicals will be tested for effectiveness in preventing bark beetle attack and also for killing the brood in infested trees.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0030, WILDLIFE HABITAT CHANGES RESULTING FROM THE REVEGETATION OF ABANDONED FARMLAND

J.W. CASLICK, Cornell University, Agricultural Experiment Sta., *Ithaca, New York* 14850 (0010761; NYC-147553)

OBJECTIVE: Determine the rate and patterns of natural revegetation on abandoned farmlands and develop techniques for arresting this process, where desirable for wildlife habitat improvement.

APPROACH: A new cover-type map of a specific area will be made and then compared to similar maps prepared in 1928 and 1941. Time-lapse aerial photographs will be used to map three strata of revegetation on a larger area. If possible, rates of revegetation then will be correlated with land classification. Controlled burning and deer exclosures will be utilized to determine interactions of vegetative response.

PROGRESS: Time-lapse aerial photography was used to measure changes in ground cover on 314,240 acres of central New York, where about 75% of the land has been retired from agricultural use since 1900. Each 1/100th square kilometer (about 2-1/2 acres) was classified as predominantly one of six vegetative cover classes, using 1968 photos. Ten percent random sampling of 1938 and 1954 photos provided comparative data from which rates of forest regeneration were developed for the 30- year period; these rates were then examined for correlation to six ranges of soil pH, six soil drainage classes, and three physiographic site positions. Computer techniques were used. During 30 years, cultivated land decreased about 10%, while acreage in full forest cover increased 6%; there was a net loss of 15% in acreage having less than 50% crown cover. The rate of crown cover change was found to be remarkably constant, increasing about one percent each three years. North and south slopes had much faster rates of forest regeneration than other slopes; reforestation of hills occurred more than twice as rapidly as reforestation of valleys, on a land area basis, although valleys reforested at a faster rate than did plain or hill sites. Techniques developed in this study proved useful in determining long-term trends in vegetative cover conditions over a large area, and in relating them to site factors.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0031, A STUDY OF PARAMETERS AFFECTING EMISSIONS FROM TURBINE ENGINES

C.W. KAUFFMAN, Univ. of Cincinnati, School of Engineering, *Cincinnati, Ohio* 45221 (NSG 3045; 505-04-31)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0032, EXAMINATION OF REQUIREMENTS AND METHODS FOR REPORTING ATMOSPHERIC INFORMATION

J.K. LEURS, Univ. of Dayton, Graduate School, *Dayton, Ohio* 45409 (NAS 8-31294; 505-08-10)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0033, INTEGRATING UPPER AND LOWER ATMOSPHERIC WIND PROFILES AND STATISTICS

R.L. INMAN, Univ. of Oklahoma, School of Arts, *Norman, Oklahoma* 75069 (NAS 8-31377; 989-13-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0034, PHYSIOGRAPHIC CLASSIFICATION OF SOUTHERN PINE FOREST LANDS

T. SILKER, Okla. St. Univ., Agricultural Experiment Sta., *Stillwater, Oklahoma* 74075 (0060893; OKL01526)

OBJECTIVE: Organize physiographic land patterns into a system having significance and utility for resource managers. Develop a physiographic map of southern region using the new systems.

APPROACH: Current information on physiography, soils, and surface geology related to forest vegetation will be analyzed and coordinated. Localized information will be reorganized to form a unified regional system. Map development will be on a state basis, utilizing local authorities, aerial photography, and space imagery when appropriate.

PROGRESS: Geological-pedological-phytosociological relationships were extensively studied and related to geomorphic patterns in Oklahoma, Arkansas, Texas, Tennessee, Kentucky, Alabama, Georgia, and Florida. This allowed accumulation of ground-truth information that may be related to project objectives and ERTS images. Two symposia on ERTS equipment and procedures were attended to become acquainted with remote sensing potential and project submittal requirements. Oklahoma State University staff secured resource material and arranged for and accompanied soil scientists of the USFS and SCS, and an OSU geologist on a 3-day field trip with the project leader, Earl Hodgkins, of Auburn University. Geomorphic-pedological-phytosociological relationships were studied in the Coastal Plain, Ouachita and Ozark Highlands of Oklahoma. Geology-soil-wildlife habitat conditions and data collected by Don Savage, OSU Zoology Department, were reviewed with him at the Cookson Hills Refuge.

SUPPORTED BY Oklahoma State Government - Oklahoma City

5.0035, EARLY SUCCESSION IN COASTAL FORESTS OF WESTERN OREGON

W.W. CHILCOTE, Oregon State University, Agricultural Experiment Sta., *Corvallis, Oregon* 97331 (0025170; ORE00328)

OBJECTIVE: Develop a base-line synecological classification for Coast Range forests in Oregon founded upon forest-site-successional relationships including forests of all ages. Develop a predictive model of early succession following tree removal involving various kinds of cutting practices. Elucidate the ecology of plant species exerting a strong influence in succession and/or acting as sensitive environmental indicators. Contribute to the understanding of the plant ecology of this ecosystem.

APPROACH: Describe old growth forest stands along recognized climatic and soil gradients. From this forest-site base determine the succession for each forest-site type through study of successively younger forest stands. Describe in detail early succession following logging for each forest-site type. Develop a predictive model succession for Coast Range forest sites and a knowledge of the ecology of key plant species.

PROGRESS: Work during the past year focused on two efforts: to complete manuscripts dealing with microclimates associated with early stages in succession and a revision of the project (now entitled Early Succession In Coastal Forests of Western Oregon), and the initiation of this broader based study. Manuscripts deal with studies describing temperature and moisture patterns as influenced by key plant species exerting primary control during predictable periods during early succession on clear-cuts representing one forest site-type. The initiation of the broader based study concentrated on locating old growth 'base-line' stands through satellite, U-2 and low level flight photographs. The stand selection process based upon these photographs and field checks has begun. Decisions on sampling procedures and analysis techniques have been generally resolved.

SUPPORTED BY Oregon State Government - Salem

5.0036, A NUMERICAL WEATHER PREDICTION MODEL

C.W. KREITZBERG, Drexel University, School of Science, *Philadelphia, Pennsylvania* 19104 (NAS 8-31235; 175-61-71)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0037, ECOLOGY AND CONTROL OF GRAPE INSECTS AND MITES

G.L. JUBB, Penn. State University, Agricultural Experiment Sta., *University Park, Pennsylvania* 16802 (0060776; PEN01979)

OBJECTIVE: Determine ecological relationships between beneficial and harmful species, evaluate and perfect control procedures for grape pests.

APPROACH: Various traps and collection techniques will be used to record seasonal activity and to survey for natural enemies of pests. Effects of pest feeding will be determined with artificial infestations or by simulating damage. Replicated field plot experiments will be used to evaluate control methods. Periodic field sampling and remote sensing will be evaluated for monitoring pest populations.

PROGRESS: Control studies showed that single foliar sprays of delnav, dicofol, Omite, oxydemetonmethyl, Plictran and phosalone were more effective than Dikar in suppressing populations of European red mite (ERM). One post-bloom spray and one late-August spray of dicofol were needed to hold ERM below economic damage levels. Mite predators of ERM were mainly Zetzellia mali and Amblyseius spp. They were most abundant in late July and early September after ERM had inflicted economic damage to Concord grapes. Pest monitoring studies with sex pheromone traps indicated average daily catches of redbanded leafroller of only one moth per trap during the July flight period resulting in no economic damage at harvest. Sex pheromone traps for grape berry moth attracted less than 0.5 moths/trap/day during the two flight periods. No berry moth damage was detected at harvest. Aerial infrared photography was used successfully to detect red mite infestations on Concord grapes. Low volume sprayers (Berthoud, Kinkelder and Myers) provided adequate coverage of grapevines as compared with a dilute sprayer. Excellent control of grape phylloxera and European red mite was obtained with low volume sprayers.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0038, SOIL LANDSCAPE CHARACTERISTICS AFFECTING LAND USE PLANNING AND RURAL DEVELOPMENT

F.C. WESTIN, South Dakota State University, Agricultural Experiment Sta., *Brookings, South Dakota* 57006 (0062181; SD00642)

OBJECTIVE: Define, map, and evaluate soil landscape units in terms of alternative land uses in rural and suburban areas. Develop and publish soil landscape guides for land use planning and rural development.

APPROACH: Involve representatives from two or more agencies or disciplines in the planning, execution, and analysis. Evaluate the landscape units by the employment of new techniques in remote sensing and photo-imagery and endeavor to perceive new delineations in the landscape which can also be quantified. Use technique of 'density slicing' to examine photo-imagery of selected soil landscapes. Guides for rural land assessment and county or township equalization procedures are being constructed. An ultimate goal is to develop a regional land resource map and data bank from which can be derived specific guides in tabular or graphic form for alternate land use planning and management.

PROGRESS: About one million acres were surveyed by the S. Dak. cooperative soil survey this year with about one-third of this acreage covered in this reporting period. These soil surveys were interpreted for the best land use, for crop and range yields and for forest, recreational and wetland management. At present, there are 9 counties with modern published soil surveys; 13 with modern soil survey field mapping completed, and in process of publication, and 11 with modern soil surveys being conducted and with dates of completion set. County land evaluation guides now are published for all east river counties except three, and preliminary data have been furnished the S.D. Dept. of Revenue for all west river counties except Shannon and the Black Hills counties. Collaborated with Remote Sensing Institute and NASA to investigate the use of ERTS imagery for identification of Soil Associations. The results of these studies were presented at a NASA Symposium on Significant Results, March 23-25 at NASA-Goddard, Greenbelt, Maryland, and at an International Symposium on Approaches to Earth Survey Problems Through the Use of Space Techniques, held May 25 at Konstanz, Germany. Cooperative work with Remote Sensing on soil limitations present in Oahe project area. Detailed field studies correlated with remote sensing data for erosion and claypan limitation.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0039, STUDY OF THE EFFECT OF VERTICAL SHEAR ON THUNDERSTORM DEVELOPMENT

J.R. CONNELL, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916 (NAS 8-31197; 175-61-71)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0040, RANGELAND REMOTE SENSING

R.H. HASS, Texas A & M University System, Agricultural Experiment Sta., *College Station, Texas* 77843 (0062471; TEX01978-RI)

OBJECTIVE: Initiate research on the use of remote sensing technology for: conducting rangeland inventory and analysis, monitoring rangeland vegetational changes, and observing natural vegetation systems as phenological indicators.

APPROACH: A search of the relevant literature will be made and a request for information will be made to C.R.I.S. Pilot experiments will be conducted and the data used to design definitive experiments. This information will be incorporated into a concise project outline and a revised Research Resume and Classification of Research.

PROGRESS: This project initiated in 1972 to investigate the use of remote sensing technology for the purpose of: conducting inventories and analyses of rangeland resources, monitoring seasonal and long-term rangeland vegetation changes resulting from weather and management conditions, and observing natural vegetation systems as phenological indicators. An extensive review of literature pertinent to rangeland remote sensing and a draft of the full project has been completed. A cooperative effort with the Remote Sensing Center at Texas A&M University has been initiated in 1972 to conduct research using ERTS-1 multisensor satellite data to analyze natural vegetation systems of the Great Plains Corridor. This NASA-funded endeavor will: evaluate the importance of 'time' as an important parameter in discriminating broad land-forms, soil and vegetation associations; determine the feasibility of using natural vegetation systems for modeling the vernal advancement (green wave effect); and investigate the possibility of using rangeland vegetation in the Great Plains Corridor as a 'phenological indicator' for agricultural uses. A first phase effort effort, assemble a multidiscipline team to handle the various phases of this project, has been completed and data are currently being received from ten test sites in the six Great Plains Corridor states and from the ERTS-1 satellite.

SUPPORTED BY Texas State Government - Austin

5.0041, PHYSIOGRAPHIC CLASSIFICATION OF SOUTHERN PINE FOREST LANDS

D. MOEHRING, Texas A & M University System, Agricultural Experiment Sta., *College Station, Texas* 77843 (0061235; TEX02841)

OBJECTIVE: Organize physiographic land patterns into a system having significance and utility for resource managers. Develop a physiographic map of southern region using the new system.

APPROACH: Current information on physiography, soils, and surface geology related to forest vegetation will be analyzed and coordinated. Localized information will be reorganized to form a unified regional system. Map development will be on a state basis, utilizing local authorities, aerial photography, and space imagery when appropriate.

PROGRESS: The Conservation Needs Inventory of Texas was analyzed to identify the major forest soils in east Texas, their distribution and limitations to forest practices. These data were supplied to the project coordinator.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0042, REMOTE SENSING AS A TECHNIQUE FOR IDENTIFICATION AND SURVEY OF IMPORTED FIRE ANT INFESTATIONS

J.K. OLSON, Texas A & M University System, Agricultural Experiment Sta., *College Station, Texas* 77843 (0061254; TEX01935)

OBJECTIVE: Assess capability of various remote sensing techniques to detect imported fire ant colonies; evaluate remote sensing as a means for conducting fire ant surveys over large geographic areas; standardize a survey procedure using remote sensing techniques; investigate the use of remote sensing as a means for assessing effects of applied fire ant control measures.

APPROACH: Conduct aerial and ground experiments at selected sites infested by imported fire ant utilizing black and white, color and color infrared photography as well as thermal imagery. Evaluate each system on the basis of ground truth surveys. Using system selected in Objective 1, conduct aerial missions over large geographic areas which provide variations in topography and degree of imported fire ant infestation. Examine results for accuracy of the technique as affected by variables inherent with large area surveys. Standardization of a technique will depend upon the system selected. Maximum altitude and cost will be considered along with survey accuracy. Conduct aerial sensing missions over areas treated for imported fire ant to determine whether or not active mounds can be differentiated from inactive or ‘dead‘ mounds.

PROGRESS: Five photographic missions were flown over the primary research sites at serial altitudes of 500-8000 feet. Color, color infrared, and black and white infrared film were evaluated. Ground truth surveys indicate that fire ant colonies can be detected by the above film types to altitudes of 4500 feet. The maximum effective altitude for detecting the mounds was determined to be near 3000 feet. Indications are that resolution of fire ant mounts increases from 500 to around 2000 feet based on percentage of mounds detected. The period from December through March was clearly the most effective time for aerial infrared detection of mounds. Mounds are more distinct at this time due to increased mound buildings by the ant and lack of vegetation both on and surrounding the mounds. Color infrared was evaluated as being superior to both black and white infrared and color film types based on resolution of mounds at various altitudes during different seasons of the year.

SUPPORTED BY Texas State Government - Austin

5.0043, MEASURE NITRIC OXIDE IN THE STRATOSPHERE

A.W. SHAW, Utah State University, School of Engineering, *Logan, Utah* 84321 (DES75-09206)

This research involves a program of stratospheric nitric oxide (NO) measurements. This program includes the feasibility testing and construction of an improved measurement instrument capable of measuring stratospheric NO profiles from both balloons and rockets.

Following the instrument construction, measurements will be made from four small lower altitude balloons, four large balloons, and one rocket.

SUPPORTED BY U.S. Natl. Science Foundation

5.0044, ROCKETSONDE DATA PROCESSING AND PARTICIPATION IN THE METEOROLOGICAL ROCKET/NIMBUS SATELLITE DATA COMPARISON PROJECT

F.L. STAFFANSON, Univ. of Utah, School of Engineering, *Salt Lake City, Utah* 84112 (NAS 6-2627; 607-07-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0045, GRAFTON-BARRETT WILDLIFE PROJECT - TEST AERIAL PHOTOGRAPHY OF GRAFTON, VERMONT

R.W. FULLER, Univ. of Vermont, Agricultural Experiment Sta., *Burlington, Vermont* 05401 (0063840; VT00176)

OBJECTIVE: Determine the type of film and photographic scale which will permit accurate mapping of the forest cover types in Grafton, Vermont, special emphasis will be placed on identifying and characterizing aspen stands.

APPROACH: A series of aerial photographs will be made along a predetermined flight line to test the variables of film type and altitude; these will be interpreted and judged with respect to proper choices for future aerial photography which will be most useful to the Grafton-Barrett Wildlife Project.

PROGRESS: A flight line was established through the study area at Grafton, Vt., which transected variables in physiography and vegetational cover. It was photographed from the air in mid-May, when aspen (Populus tremuloides) was in primordial leaf stage, using a Hasselblad 70 mm camera, 3 films (panchromatic black and white, ektachrome color, color infrared) at four scales (1‘:133’, 1‘:330’, 1‘:500’, 1‘:1,000’). All scales of black and white film had severe limitations for identification of tree species compared to color film. Aspen and 6 other trees were positively identified in pure and mixed types on ektachrome color and color infrared film at scales of 1‘:500’ and larger. Conditional identification of 3 additional species was achieved. Color films at 1‘:500’ also provided topographical, geological, edaphic, hydrological, and cultural information. Ektachrome color and color infrared film at a scale of 1‘:500’ were concluded to be most efficient and practical for the products desired from aerial photography.

SUPPORTED BY Vermont State Government - Montpelier

5.0046, ANALYSIS OF DATA FOR ERTS FOLLOW-ON INVESTIGATION

R. DOLAN, Univ. of Virginia, School of Arts, *Charlottesville, Virginia* 22903 (NAS 5-20999; 641-15-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0047, REMOTE MEASUREMENTS OF ATMOSPHERIC TRACE CONSTITUENTS

E.C. KINDLE, Old Dominion University, School of Science, *Norfolk, Virginia* 23508 (NSG 1131; 176-21-31)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0048, REGIONAL PLANNING & RESOURCE MANAGEMENT - APPLICATIONS OF MONITORING AGRICULTURE LAND USE UTILIZING REMOTE SENSING

B.J. NIEMANN, Univ. of Wisconsin, Agricultural Experiment Sta., *Madison, Wisconsin* (0062731; WIS01906)

OBJECTIVE: Evaluate the use of remote sensing (near infrared photography .7- .9 microns), thermal 8. - .2 microns and sensing platforms including conventional, high altitude and satellite systems as a data source for agriculture and rural land use planning. Emphasis will be placed on the detection of resources for inclusion in the projected state wide spatial resource data bank.

APPROACH: With the assistance of a remote sensing technical/liason committee, data needs potentially applicable for detection by remote sensing will be identified. Interpreted data will be compared with ground truth supplied by the technical/liason committee or by comparing with either of three existing spatial computer data banks.

PROGRESS: Progress includes the interpretation and analysis of RB 57 infrared photography (1:120,000) to determine the ability of detecting inactive, marginal agricultural lands. The results indicate that inactive agricultural lands are detectable from high platform sensors when replacement vegetation types (e.g., herbs and forbs) are used as an indicator of inactivity or marginality. In addition, the derived vegetation data proved to be quite useful as part of a computer geo-information system for recreation activity modeling and qualifying impact from proposed highway systems.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0049, STRATOSPHERIC AEROSOL MEASUREMENT INSTRUMENT

T.J. PEPIN, Univ. of Wyoming, School of Arts, *Laramie, Wyoming* 82070 (NAS 1-13797; 642-12-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, DEVELOPMENT AND EVALUATION OF AUTOMATED ERROR DISCRIMINATION INSTRUCTION FOR FLIGHT SIMULATOR APPLICATION
E.L. MARTIN, U.S. Air Force, Human Resources Laboratory, *Chandler, Arizona* 85224 (DF222020)

To develop and evaluate an automated feedback program for application in flight simulator training programs. A primary goal of this effort is to generate techniques and procedures designed to train the student pilot in the detection and prevention of aircraft control errors. An additional objective is to evaluate the contribution of various advanced training provisions of flight simulators for the purposes of identifying cost-effective flight simulator training feature requirements.

The advanced training provisions and the automated performance measurement system developed for ASUPT will be utilized to compare several experimental procedures for a self-taught automated error discrimination program. Training on standard flight maneuvers in ASUPT will be accompanied by feedback signals indicating flight path errors. The timing and nature of feedback required for fastest acquisition of error discrimination will be investigated. The experimental procedures will be evaluated in terms of acquisition rate and magnitude of errors with and without performance feedback contingencies in effect. The advanced training provisions utilized in this effort include the problem freeze, automated student feedback, automated demonstrations, maneuver playback, and graphic display modes.

Supporting agency address information: AF Human Resources Laboratory FTT, Williams AFB, Arizona 85224

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0002, ROLE OF PROLACTIN AND VASOPRESSIN IN REGULATION WATER AND SALT BALANCE
UNKNOWN, Univ. of California, Graduate School, *Los Angeles, California* 90024 (NCA 2-90502; 970-21-16)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0003, SYNOPTIC RELATIONS IN THE VESTIBULO-OCULAR SYSTEM
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45508; 970-21-11)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0004, ANALYSIS OF VISUAL ORIENTATION AND VISUAL EFFORT
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45516; 970-21-51)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0005, EFFECTS OF STATES OF PHYSICAL ACTIVITY/INACTIVITY ON HORMONE RECEPTOR BINDING
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45509; 970-21-14)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0006, NUTRITION AND CALCIUM HOMEOSTASIS
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Jose, California* 95114 (NCA 2-75515; 970-21-61)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0007, SPECIFICATION AND EVALUATION OF SIMULATOR FOR A CONVERTER/FLIGHT CONTROLS TEST STATION
G.G. MILLER, U.S. Air Force, Human Resources Laboratory, *Denver, Colorado* 80230 (DF221990)

To develop a generalizable task analytic technique which can be used to specify the fidelity requirements of technical training part task trainers. Specific emphasis will be given to the development of functional specifications for a part task trainer to train immediate level test station operators and repairmen for the F-111 aircraft.

Performance requirements will be developed through the use of a special task analytic technique. Weighted hierarchical ordering of task data will be used to make functional fidelity decisions. Design characteristics will be validated by evaluating a prototype part task trainer that will be funded by the customer (ATC).

Supporting agency address information: AF Human Resources Laboratory TTT, Lowry AFB, Colorado 80230

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0008, DESIGN STUDY FOR TURBINE ENGINE PARTICULATE SAMPLER
D. FENTON, I I T Research Institute, *Chicago, Illinois* 60616 (DF319380; F41609-75-C-0024)

The chemical characterization of hydrocarbons in turbine engine exhaust particulate is essential to establish biomedical criteria effecting Air Force aircraft maintenance and operating schedules and procedures. Although aircraft exhaust must almost certainly contain polynuclear aromatic compounds, their detection in conventionally collected smoke filters was impractical owing to size and concentration limitations. Hence this effort will provide design criteria for a turbine engine sampling system to maximize the collection efficiency of extremely small aerosol and particulate matter.

Contractor shall conduct a comprehensive review of past and available particulate sampling methods/systems, and shall design a sampling method/system for maximizing the collection of polycyclic or polynuclear aromatic compounds. The sampling considerations shall include engine power setting, exhaust velocity, temperature, particle size, aerosols, absorbed material and post collection handling procedures. This procurement does not involve hardware delivery.

Supporting agency address information: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0009, STUDIES IN BIOLOGICAL HEAT TRANSFER AND THERMOREGULATION
J.C. CHATO, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

Various engineering aspects of biological heat transfer are studied. Examples are: the thermal design of protective garments in hostile environments, e.g., outer space, mines, and deep sea; analytical models of the thermal behavior of living systems, particularly the human body; comparison of work in the sun and in the shade; and the measurement of thermophysical properties of biological materials 'in vivo' as well as 'in vitro'.

SUPPORTED BY University of Illinois

6.0010, THE EFFERENT COMPONENT OF THE VESTIBULAR NERVE IN THE BULLFROG
P.M. FULLER, Univ. of Louisville, Graduate School, *Louisville, Kentucky* 40208 (NSG 2067; 970-21-11)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0011, STUDY OF THE EXPERIMENT OPERATOR CONCEPT DURING THE NASA/ESRO CV 990 ASSESS MISSION
K.A. DICK, Univ. of Maryland, Graduate School, *College Park, Maryland* 20740 (NSG 2079; 975-50-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0012, HUMAN BREATHING/METABOLISM SIMULATOR

R.G. BARLETT, Roscoe Bartlett & Associates, *Frederick, Maryland* 21701 (DF319360; F41609-75-C-0029)

Accurate testing and evaluation of respiratory life support concepts and equipment requires a continuous monitoring and simulation capability. Enhancement of human safety and acquisition of more meaningful performance information can be accomplished with the use of a metabolic simulator designed to mimic human function corresponding to variable states of stress. Peripheral control of such a simulator should be interfaced to provide long-term programming of specific test sequences. Physiologic conditions including hyperventilation and acute exercise response should be attainable on a simulated basis, with appropriate attachments provided for oxygen regulators and masks during exposure to altitude. A remote controller should also provide a tape playback and control facility to enable simulation of actual inflight situations as recorded by the inflight physiological data acquisition system.

A human breathing/metabolism simulator will be constructed to provide the following component stages: (1) breathing simulation providing rate, volume, residual, and waveform control; (2) humidity and temperature simulation providing expired gas control comparable to anticipated human function; (3) oxygen consumption and carbon dioxide production at levels representative of normal human range and expected extremes; and (4) a remote control and monitoring assembly providing fully automated operation of the complete simulator assembly.

Supporting agency address information: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0013, CONTROL MECHANISM OF METABOLISM DURING POIKILOTHERMIA

M.L. RIEDESEL, Univ. of New Mexico, School of Arts, *Albuquerque, New Mexico* 87106 (NCA 2-10502; 970-21-14)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0014, SIMULATION SOFTWARE FOR HUMAN ENGINEERING SYSTEM ANALYSIS AND EFFECTIVENESS EVALUATION

G. SABASKY, Internat. Bus. Machines Corp., *Owego, New York* 13827 (DF319350; F33615-75-C-5152)

The objective of this effort is to provide efficient software development to assure maximum utilization of the human engineering systems simulator (HESS). HESS is a computer-based facility with which weapon system concepts and design parameters may be tested and evaluated in real-time, dynamic, interactive, simulated contexts. Software developed under this contract will support a broad range of simulation and research programs in which alternative methods of allocating man- machine functions within complex air force systems are investigated in order to identify optimum techniques of control, display and processing of system information. The programs will involve both real-time man-in- the-loop simulations and computer-programmed system models or 'pseudo- time' simulations. Efforts supported by the program include performance assessment in dynamic flight simulations and assessment of advanced control/display concepts supportive of the digital avionics information system advanced development program, command-control-communications for remotely piloted vehicles for the Air Force's Drone System Program Office, and crew station design development for strategic air command radar/navigation/electronic warfare functions.

Systems analyses will be accomplished as required to identify features essential to simulating systems for which human engineering data is required. Appropriate programming techniques will be identified and applied to permit efficient implementation of the system simulations on the HESS. Software modifications will be made as necessary to support developments in the associated research programs.

Supporting agency address information: 6570 Aerospace Medical Rsch Lab HE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0015, AWLS FAILURE/DEGRADED PERFORMANCE ANALYSIS

R.J. HOVDE, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF134780)

At present, no data exists showing the amount of degradation of approach tracking when manual inputs occur after system failure. The objective is to establish the performance degradation caused by the pilot entering the control loop after a failure induced loss of an autopilot axis.

A pilot-in-the-loop computer simulation and flight test results will be compared to the baseline performance to establish the extent of the degradation. Selected failures, both in AWLS equipment and aircraft systems will be accomplished at various altitudes during approaches. The pilot will then enter the loop, continuing the approach as far as possible under safety considerations.

Supporting agency address information: AF Flight Dynamics Laboratory FGS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0016, LOW VISIBILITY LANDING SIMULATION PROGRAM

M.B. PORTER, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF135660)

The Air Force and Federal Aviation Administration (FAA) have a joint interest in reducing civil/military system development cost and in increasing the safety of flight operations in the air terminal area by use of engineering flight simulation. Simulation programs are required to measure pilot workload performance and decision making during low visibility approach and landing in a controlled manner. The objective of this effort is to plan and properly manage simulation programs to meet these requirements. It will involve coordination of activities of the branches providing simulation support (FGD), human factors analysis (FGR), and test planning and administration (FGS). It will also involve liaison with the FAA to define mutual requirements and to report on program results.

Two initial simulation phases will be planned and conducted to establish baseline manual pilot performance in fog and to survey the factors influencing pilot external visibility requirements. These simulation programs will use the AFFDL engineering flight simulator multicrew cab with highly realistic visual attachment. The results of these two phases will be used to plan and conduct follow-on programs to study other factors including autopilot operation, head-up displays, crew procedures, and variation in aircraft size and performance.

Supporting agency address information: AF Flight Dynamics Laboratory FGT, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0017, DETECTION OF BACTERIA IN URINE BY AN ATP LUCIFERASE PROCEDURE

R. GUTEKUNST, Hahnemann Med. Coll. & Hosp., School of Medicine, *Philadelphia, Pennsylvania* 19102 (NAS 5-20865; 141-95-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0018, DEVELOPMENT OF PREVENTIVE DENTISTRY TECHNIQUES IN SUPPORT OF MANNED SPACE FLIGHT

I.L. SHANNON, Univ. of Texas, Graduate School, *Austin, Texas* 78712 (NAS 9-14560; 970-51-45)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0019, ASTP EXPERIMENT 031

B.S. CRISWELL, Baylor University, School of Medicine, *Houston, Texas* 77025 (NAS 9-14468; 966-30-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0020, ASTP EXPERIMENT O32

R.R. MARTIN, Baylor University, School of Medicine, *Houston, Texas* 77025 (NAS 9-14406; 966-30-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0021, PILOT PERFORMANCE EVALUATION SYSTEM

W. HOLT, Technology Incorporated, *Houston, Texas* (DF318730; F41609-75-C-0027)

The GAT-1 flight simulators do not simulate USAF missions and operations without supplementary equipment. Surplus and off-the-shelf components were used to satisfy a USAFSAM/NG requirement to demonstrate that the simulators were suitably sensitive to operator stress to be used with the SGO-requested program on the effects of common drugs on flying performance. Greatly enhanced mission simulations and reliability will result from interfacing the flight simulators (4) with the VN-owned PDP-12 computer.

Designated the pilot performance evaluation system (PPES), the 4 GAT-1's must be modified to produce signal outputs corresponding to altitude, heading, airspeed, vertical velocity, turn-rate, and turn coordination as well as elevator, rudder, aileron, and throttle position. These 10 signals, from each trainer, must be interfaced to a/d inputs on the PDP-12. Four pilot information display panels (PIDP) must be constructed, each consisting of (a) one burroughs self-scan TM panel display or equivalent, and (b) one actual thumbwheel switch, two toggle switches, one momentary contact push-button switch, and one audio alert. A computer interface is required to permit control and monitoring of the 4 PIDP's by PDP-12.

Supporting agency address information: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0022, ENGINEERING TEST AND EVALUATION DURING HIGH G

W.T. HOLT, Technology Incorporated, *Houston, Texas* (DF318710; F41609-75-C-0026)

New generation fighter-attack aircraft have maneuvering g envelopes that impose rapidly changing gravitoinertial forces on the pilot during both sustained maneuvers and during short pulses to high g levels. Anti- g suits and valves at the present time have the same operational characteristics that were developed during World War II. These inflation schedules are probably non-optimal for current and future fighter-attack aircraft. The purpose of this effort is to develop a family of curves on all available anti-g valves and suits and on several experimental valves and suits that are under construction.

The contractor will impose various onset rates of g to a suit-valve combination that is tested on a manikin in the centrifuge. A predetermined optimal g time-history will be developed based upon current and future fighter-attack aircraft capabilities and with this g time-history all valves and suits will be compared against each other while having the g stress imposed on them. In addition, the contractor will develop a field test program that will enable life support officers to determine when an anti-g suit should be discarded due to deterioration and excessive leakage. Finally, the contractor will install a pressure calibration system that will enable rapid and accurate calibration of all pressure transducers used in both this study and in studies conducted by USAF personnel.

Supporting agency address information: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0023, PSYCHOPHYSIOLOGICAL RESEARCH TO ANALYZE PILOT-VEHICLE SYSTEMS

J. SMIT, Natl. Aerospace Laboratory, *Amsterdam, the Netherlands* (DF289400; AF-AFOSR-2848-75)

AF function - life sciences. Deficiency - non-availability of psychophysiological research results to accurately predict human response during piloting tasks. Research - development of methods for analyzing pilot behavior in complex tasks. These tasks include low level attack fighter bomber missions and helicopter pilot workload. How research contributes - provides much needed methodology and data to analyze human behavior during piloting tasks. Very important for understanding human response and hence design aircraft and aircraft crew compartments.

Supporting agency address information: European Office of Aerospace Research and Development NRE, Box 14, FPO New York, N.Y. 09510

SUPPORTED BY U.S. Dept. of Defense - Air Force

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, OPTIMAL DATA COMPRESSION, FINITE MEMORY AND JOINT SOURCE-CHANNEL ENCODING

M.E. HELLMAN, Stanford University, School of Engineering, *Palo Alto, California* 94305 (DF036900; F44620-73-C-0065)

Spaceprobes, air or space-borne sensors for reconnaissance and surveillance, and ground-based sensors for nuclear test ban treaty monitoring have the common characteristic of remote gathering and then transmission of very large amounts of data. Unfortunately, the on-board buffers, encoders, transmitters, and ancillary devices required to deal with such amounts of data often place an excessive if not prohibitive weight, power, and cost burden on the aerospace system involved. This research effort is directed toward reducing that burden through the development of data compression schemes which can be implemented with low complexity on-board hardware. Prior research has addressed the problem from the point of view of finite memory decision theory. Emphasis will now be placed on a more promising approach which utilizes the properties of error propagating codes to achieve joint source and channel coding. Specific research topics will include further analysis of the ideal (discrete and memoryless) case, however, the primary concern will be application of these techniques to real sources such as speech, facsimile, television, and other sources. Critical problem areas are finding a good metric and finding a means to permit expending transmission time directly proportional to the amount of detail in the data stream in order to obtain high resolution. A limited amount of effort will continue in the area of finite memory systems.

Supporting agency address information: AF Office of Scientific Research NM, 1400 Wilson Blvd, Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

7.0002, DEVELOPMENT AND APPLICATION OF COMPUTER SIMULATION MODELING TECHNIQUES TO THE RPV SYSTEMS

D.B. WORTMEN, Pritsker & Associates, *Lafayette, Illinois* (DF318420; F33615-75-C-5012)

To develop a computer simulation of an RPV (remotely piloted vehicle) drone control facility (as represented by a multioperator RPV system simulator currently in operation in AMRL/HES) using the man- machine modeling techniques currently available in SAINT (systems analysis of an integrated network of tasks). The primary objective of the simulation is to enhance other RPV research efforts by providing a technique for obtaining data too costly to collect in a real-time environment. In turn, the application will enhance development of the SAINT simulation technique by requiring further development of continuous control task representation, system effectiveness metrics and dynamic decision making procedures. These new developments in the SAINT technique will not be necessarily RPV system specific and are of the type appropriate for many systems applications. These enhancements to the SAINT simulation technique will provide increased flexibility for simulating total system performance and will be utilized by system designers, human factors engineers and systems engineers. The specific application of the RPV system is of primary interest to the RPV SPO.

AMRL-HES has performed a series of experiments using the RPV simulator in which human operator performance data have been gathered. This performance data will be used as input to the computer simulation model of the RPV system described in the objective. This model will be run on the computer utilizing SAINT and the outputs will be validated against outputs of the real-time simulation. Expansion of the SAINT technique to include the necessary elements of the above defined objectives involves the application of network theory and priority structure techniques. An associated set of computer routines will be developed and interfaced with the current SAINT technique, complete documentation and a user's manual will also be prepared.

Supporting agency address information: 6570 Aerospace Medical Rsch Lab HE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

7.0003, A STUDY ON PARAMETER IDENTIFIABILITY AND ACCURACY OF PARAMETER ESTIMATES

UNKNOWN, Iowa State University, Graduate School, *Ames, Iowa* 50010 (NCA 2-40502; 505-06-81)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0004, NUMERICAL IMPLEMENTATION METHODS FOR NONLINEAR ESTIMATORS

R.L. KLEIN, Univ. of Kansas, School of Engineering, *Lawrence, Kansas* 66044 (DF041000; AF-AFOSR-2828-75)

Uncertainty is a central problem limiting performance in numerous complex air force systems today. Tighter performance specifications for future systems will exacerbate this problem. The problem arises in error correction for aided inertial navigation systems, in parameter estimation for poorly modelled systems, in state estimation for feedback control systems, in orbit determination for satellites, in detection for communications, all functions that are vital to Air Force capability. In a true sense the estimation problem is always nonlinear, although straightforward linear techniques are clearly indicated in some cases. The optimal solution for nonlinear estimation is known, but unfortunately is infinite dimensional. Several approximation methods have been developed, each with merits and drawbacks. This proposal is for research to investigate an approach suggested by the principal investigator for implementing nonlinear estimation. This approach differs from the others (point mass, gaussian sum, spline function) in that it is based upon approximating the integration needed for solution, rather than approximating the functions which make up the integrand. The investigation would compare this approach with others, considering the relative number of grid points required for approximating the estimation state function, the number of arithmetic operations per grid point per time step and the mechanism involved in increasing or decreasing the number of grid points dynamically. Other significant factors will be considered, and possibilities for implementation through parallel processing will be pursued.

Supporting agency address information: AF Office of Scientific Research NM, 1400 Wilson Blvd, Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

7.0005, IMAGE 100 SOFTWARE DEFINITION

H.P. DECELL, Univ. of Houston, School of Arts, *Houston, Texas* 77004 (NAS 9-14557; 177-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0006, MICROPROCESSOR OPERATION AND EVALUATION

W.E. BENNETT, Virginia Polytechnic Institute, School of Engineering, *Blacksburg, Virginia* 24061 (NSG 1132; 997-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, INVESTIGATIONS INTO THE JOHNSON AND VAND PROGRAM FOR IDENTIFICATION OF MULTIPHASE POWDER DIFFRACTION DATA

D. ANDERSON, Calif. State Univ. & Colleges, Graduate School, *San Jose, California* 95114 (NCA 2-75514; 195-21-04)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0002, DEFINITION OF LIDAR REQUIREMENTS AND PLASMA WAKE AND SHEATH EXPERIMENTS FOR THE AMPS LABORATORY

A.F. NAGY, Univ. of Michigan, School of Engineering, *Ann Arbor, Michigan* 48106 (NAS 8-31397; 356-36-03)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0003, FEASIBILITY STUDY OF A SENSITIVE TRAVITOMETER BASED ON MOSSBAUER RESONANCE PHENOMENON

K.H. BROWN, Northwestern Okla. State Univ., Graduate School, *Alva, Oklahoma* 73717 (NSG 1134; 141-95-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

SOCIAL SCIENCES

Includes Social Sciences (general); Administration and Management; Documentation and Information Science; Economics and Cost Analysis; Law and Political Science; and Urban Technology and Transportation.

9.0001, COST EFFECTIVE ANALYSIS OF COMMUNICATION AND CONTRACT MONITORING PROCEDURES

UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Jose, California* 95114 (NCA 2-75512; 323-50-09)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

9.0002, STUDY OF SELECTED NASA-AMES PROCUREMENT SYSTEMS

UNKNOWN, Univ. of Santa Clara, Graduate School, *Santa Clara, California* 95053 (NCA 2-85508; 997-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

9.0003, ENERGY ALTERNATIVES AND SOCIETAL VALUES

C.E. BOND, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

This investigation comprises a study of the interaction among the following: a sample societal problem, namely the energy crisis; its alternative technological and non-technological solutions and their consequences; and its defining and relevant value systems and information bases.

SUPPORTED BY University of Illinois

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, X-RAY OBSERVATIONS OF LACEPTIDS FROM OAC COPERNICUS

C.S. BOWYER, Univ. of California, School of Letters, *Berkeley, California* 94720 (NSG 5057; 831-42-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0002, ISOTOPIC COMPOSITION OF PRIMARY COSMIC RAYS H THRU FE FOR ISEE C SPACECRAFT

H. HECKMAN, Univ. of California, School of Letters, *Berkeley, California* 94720 (NAS 5-20995; 862-12-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0003, EXPERIMENTAL STUDY OF INTERACTIONS IN THE MAGNETOSPHERE BETWEEN ENERGETIC PARTICLES AND VLF WAVES

R.A. HELLIWELL, Stanford University, School of Engineering, *Palo Alto, California* 94305 (NAS 5-20871; 861-62-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0004, A STUDY OF SEISMIC VELOCITY ELECTRICAL CONDUCTIVITY AND THE STATE OF THE LUNAR CRUST

A.M. NUR, Stanford University, School of Earth Sciences, *Palo Alto, California* 94305 (NSG 7117; 195-20-03)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0005, SCIENTIFIC RATIONALE AND FEASIBILITY OF DEVELOPING A PLANETARY SEM-EDA

A.L. ALBEE, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (NSG 7125; 185-47-81)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0006, PROPERTIES OF MOON AND ITS ENVIRONMENT FROM LUNAR MAGNETOMETER MEASUREMENTS

C.W. PARKIN, Univ. of Santa Clara, Graduate School, *Santa Clara, California* 95053 (NSG 2075; 383-31-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0007, LUNAR NOMENCLATURE

F. ELBAZ, Smithsonian Institution, *Washington, District of Columbia* 20560 (NSG-7006; 163680)

Assistance for the Principal Investigator who is a member of the 'Task Group on Lunar Nomenclature' of the International Astronomical Union.

The current NASA program of producing lunar maps requires large lists of new names which will be compiled by the Principal Investigator with the assistance of the Research Associate. The Principal Investigator will have the responsibility of applying the names to proper lunar features as well as keeping the records of all changes to the existing lunar nomenclature system.

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0008, CHEMICAL AND MINERALOGICAL ANALYSES OF INDIVIDUAL CHONDRULES

K. FREDRIKSSON, Smithsonian Institution, *Washington, District of Columbia* 20560

Individual chondrules from different types of chondrites will be analyzed chemically and by x-diffraction because they are the fundamental constituents of the oldest known rocks, meteorites. Although some agreement has emerged (e.g., through lunar studies) about the processed involved (impacts) in the generation of chondrules and chondrites, little is known about the true bulk composition of chondrules or their parent material. We will employ newly developed techniques, instrumentation and concepts for the analysis of individual chondrules in order to relate them and meteorites in general to the early stages of the evolution of the solar system.

SUPPORTED BY Smithsonian Institution

10.0009, INVESTIGATIONS OF THE COMPOSITION OF MATRICES IN VARIOUS CHONDRITIC METEORITES

K. FREDRIKSSON, Smithsonian Institution, *Washington, District of Columbia* 20560

We propose to separate chondrules, lithic and mineral fragments from the finegrained matrix which appear to be akin to carbonaceous chondrites in chemical composition and thus may represent a 'primitive' condensate in the solar nebula. The distribution of some critical elements (e.g., heavy volatiles and rare gasses) between these fractions will be determined in order to test the hypothesis.

SUPPORTED BY Smithsonian Institution

10.0010, GIANT PLANET MODELS

UNKNOWN, Univ. of Florida, Graduate School, *Gainesville, Florida* 32601 (NCA 2-40501; 505-06-81)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0011, REANALYSIS OF LUNAR DATA FOR STUDY OF LUNAR ELECTRO-MAGNETIC RESPONSE

T.R. MADDEN, Mass. Inst. of Technology, School of Science, *Cambridge, Massachusetts* 02139 (NSG 7115; 383-20-03)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0012, THEORETICAL ASTROPHYSICS

A. DALGARNO, Smithsonian Institution, *Cambridge, Massachusetts* 02138 (3IT-4T50-01)

Computation programs have been developed for constructing models of the basic atomic and molecular processes in the creation, generation, and dissipation of energy. This theoretical research will help establish the parameters for study of terrestrial, stellar and planetary atmospheres, as well as the interstellar and intergalactic mediums.

Detailed calculations were performed of the ultraviolet fluorescent pumping mechanism for populating the rotational levels of molecular hydrogen and used to construct models of interstellar clouds. Quantitative studies of chemical schemes for the formation of interstellar molecules were continued. The efficiency of the main cooling process in diffuse clouds containing molecular hydrogen was calculated.

Theoretical investigations of a wide range of atomic and molecular processes of atmospheric and astrophysical interest were carried out.

SUPPORTED BY Smithsonian Institution

10.0013, ATOMIC & MOLECULAR PHYSICS

G. VICTOR, Smithsonian Institution, *Cambridge, Massachusetts* 02138 (31A-4A50-01)

Methods and computation programs have been developed for constructing theories and models of the basic atomic and molecular processes in the creation, generation, and dissipation of energy. This theoretical research helps establish the parameters for study of terrestrial, stellar, and planetary atmospheres, as well as the interstellar and intergalactic mediums.

SUPPORTED BY Smithsonian Institution

10.0014, HIGH SPATIAL RESOLUTION MULTICOLOR OBSERVATION OF NEPTUNE DURING OCCULATION BY THE MOON

J. VEVERKA, Cornell University, School of Arts, *Ithaca, New York* 14850 (NSG 7126; 196-41-80)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0015, A STUDY OF SOLAR-INTERPLANETARY RELATIONSHIP USING GALACTIC COSMIC RAY DECREASES

S.A. KORFF, New York University, School of Engineering, *New York, New York* 10453 (NSG 7116; 385-46-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0016, INVESTIGATION OF THE RADIUS AND COMPOSITION OF SERIUS B FROM FAR UV OBSERVATIONS
M.P. SAVEDOFF, Univ. of Rochester, School of Arts, *Rochester, New York* 14627 (NSG 5054; 831-42-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0017, PHYSIOCHEMICAL BASIS FOR EVALUATING LUNAR PETROGENESIS
A. MUAN, Penn. State University, School of Earth Sciences, *University Park, Pennsylvania* 16802 (NSG 7120; 195-20-03)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0018, REVIEW OF POSSIBLE STUDIES OF THE MINERALOGY AND PETROLOGY OF MARS AND MERCURY
UNKNOWN, Virginia Polytechnic Institute, Graduate School, *Blacksburg, Virginia* 24061 (NSG 7111; 185-50-81)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

GENERAL

11.0001, TRAINING OF PREDOCTORAL GRADUATE STUDENTS IN SPACE-RELATED SCIENCES AND ENGINEERING
Z.W. DYBCZAK, Tuskegee Institute, School of Engineering, *Tuskegee Institute, Alabama* 36088 (NGT 01-005-750; 010-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

11.0002, PRODUCTION RATES
P.D. FELDMAN, Johns Hopkins University, School of Arts, *Baltimore, Maryland* 21218 (NSG 5065)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

11.0003, TRAINING OF PREDOCTORAL GRADUATE STUDENTS IN SPACE-RELATED SCIENCES AND ENGINEERING
R.M. ZIMMERMAN, New Mexico State University, School of Engineering, *Las Cruces, New Mexico* 88003 (NGT 32-003-750; 010-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

11.0004, IMAGE 100 PROCEDURE MANUAL DEVELOPMENT
L.F. GUSEMAN, Texas A & M University System, School of Science, *College Station, Texas* 77843 (NAS 9-14556; 177-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N75-24669*+ National Aeronautics and Space Administration, Washington, D.C.
A CUMULATIVE INDEX TO AERONAUTICAL ENGINEERING: A SPECIAL BIBLIOGRAPHY, JANUARY 1975
Jan. 1975 568 p refs
(NASA-SP-7037(53)) Avail: NTIS HC $10.00 CSCL 01B

A cumulative index to the abstracts contained in NASA SP-7307 (41) through NASA SP-7037 (52) is presented. Subject, personal author, corporate source, contract, and report number indexes are included. Author

N75-24670*+ National Aeronautics and Space Administration, Washington, D.C.
AERONAUTICAL ENGINEERING: A SPECIAL BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 54
Feb. 1975 99 p refs
(NASA-SP-7037(54)) Avail: NTIS HC $4.00 CSCL 01A

This bibliography lists 316 reports, articles, and other documents introduced into the NASA scientific and technical information system in January 1975. Author

N75-24671* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LARGE-SCALE WIND-TUNNEL TESTS OF THREE VEHICLES INCORPORATING A DEPLOYABLE RIGID WING
Terrell W. Feistel and Ralph L. Maki Aug. 1974 64 p ref
(NASA-TM-X-62405; A-5854) Avail: NTIS HC $4.25 CSCL 01B

Wind-tunnel tests were performed to determine the aerodynamic characteristics of three full-scale vehicles incorporating a unique folding metal wing, and to investigate its deployment characteristics. The static aerodynamic data are presented without analysis. Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N75-24672*# Boeing Co., Renton, Wash.
PREDICTION OF UNSTEADY AERODYNAMIC LOADINGS CAUSED BY LEADING EDGE AND TRAILING EDGE CONTROL SURFACE MOTIONS IN SUBSONIC COMPRESSIBLE FLOW: COMPUTER PROGRAM DESCRIPTION
M. C. Redman and W. S. Rowe May 1975 157 p refs
(Contract NAS1-12020)
(NASA-CR-132634) Avail: NTIS HC $6.25 CSCL 20K

A digital computer program has been developed to calculate unsteady loadings caused by motions of lifting surfaces with leading edge or trailing edge controls based on the subsonic kernel function approach. The pressure singularities at hinge line and side edges have been extracted analytically as a preliminary step to solving the integral equation by collocation. The program calculates generalized aerodynamic forces for user supplied deflection modes. Optional intermediate output includes pressure at an array of points, and sectional generalized forces. From one to six controls on the half span can be accommodated. Author

N75-24673*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ANALYSIS OF VARIOUS DESCENT TRAJECTORIES FOR A HYPERSONIC-CRUISE, COLD-WALL RESEARCH AIRPLANE
Pierce L. Lawing Washington Jun. 1975 62 p refs
(NASA-TN-D-7860; L-9778) Avail: NTIS HC $4.25 CSCL 01A

The probable descent operating conditions for a hypersonic air-breathing research airplane were examined. Descents selected were cruise angle of attack, high dynamic pressure, high lift coefficient, turns, and descents with drag brakes. The descents were parametrically exercised and compared from the standpoint of cold-wall (367 K) aircraft heat load. The descent parameters compared were total heat load, peak heating rate, time to landing, time to end of heat pulse, and range. Trends in total heat load as a function of cruise Mach number, cruise dynamic pressure, angle-of-attack limitation, pull-up g-load, heading angle, and drag-brake size are presented. Author

N75-24674*# Aerophysics Research Corp., Bellevue, Wash.
AN INVESTIGATION ON THE EFFECT OF SECOND-ORDER ADDITIONAL THICKNESS DISTRIBUTIONS TO THE UPPER SURFACE OF AN NACA 64 SUB 1-212 AIRFOIL
Donald S. Hague and Antony W. Merz Jan. 1975 47 p refs
Supercedes TN-194
(Contract NAS2-8599)
(NASA-CR-137701; TN-194) Avail: NTIS HC $3.75 CSCL 01C

An investigation was conducted on a CDC 7600 digital computer to determine the effects of additional thickness distributions to the upper surface of an NACA 64 sub 1 - 212 airfoil. Additional thickness distributions employed were in the form of two second-order polynomial arcs which have a specified thickness at a given chordwise location. The forward arc disappears at the airfoil leading edge, the aft arc disappears at the airfoil trailing edge. At the juncture of the two arcs, x = x, continuity of slope is maintained. The effect of varying the maximum additional thickness and its chordwise location on airfoil lift coefficient, pitching moment, and pressure distribution was investigated. Results were obtained at a Mach number of 0.2 with an angle-of-attack of 6 degrees on the basic NACA 64 sub 1 - 212 airfoil, and all calculations employ the full potential flow equations for two dimensional flow. The relaxation method of Jameson was employed for solution of the potential flow equations. Author

N75-24675*# Aerophysics Research Corp., Bellevue, Wash.
AN INVESTIGATION ON THE EFFECT OF SECOND-ORDER ADDITIONAL THICKNESS DISTRIBUTIONS TO THE UPPER SURFACE OF AN NACA 64-206 AIRFOIL
Antony W. Merz and Donald S. Hague Feb. 1975 32 p refs Supercedes TN-195
(Contract NAS2-8599)
(NASA-CR-137702; TN-195) Avail: NTIS HC $3.75 CSCL 01C

An investigation was conducted on a CDC 7600 digital computer to determine the effects of additional thickness distributions to the upper surface of an NACA 64-206 airfoil. Additional thickness distributions employed were in the form of two second-order polynomial arcs which have a specified thickness at a given chordwise location. The forward arc disappears at the airfoil leading edge, the aft arc disappears at the airfoil trailing edge. At the juncture of the two arcs, x = x, continuity of slope is maintained. The effect of varying the maximum additional thickness and its chordwise location on airfoil lift coefficient, pitching moment, and pressure distribution was investigated. Results were obtained at a Mach number of 0.2 with an angle-of-attack of 6 degrees on the basic NACA 64-206 airfoil, and all calculations employ the full potential flow equations for two dimensional flow. The relaxation method of Jameson was employed for solution of the potential flow equations. Author

N75-24676*# Aerophysics Research Corp., Bellevue, Wash.
THEORETICAL EFFECT OF MODIFICATIONS TO THE UPPER SURFACE OF TWO NACA AIRFOILS USING SMOOTH POLYNOMIAL ADDITIONAL THICKNESS DISTRIBUTIONS WHICH EMPHASIZE LEADING EDGE PROFILE AND WHICH VARY QUADRATICALLY AT THE TRAILING EDGE
Anthony W. Merz and Donald S. Hague Mar. 1975 40 p refs Supersedes TN-199
(Contract NAS2-8599)
(NASA-CR-137703; TN-199) Avail: NTIS HC $3.75 CSCL 01C

An investigation was conducted on a CDC 7600 digital computer to determine the effects of additional thickness distributions to the upper surface of the NACA 64-206 and 64 sub 1 - 212 airfoils. The additional thickness distribution had the form of a continuous mathematical function which disappears at both the leading edge and the trailing edge. The function behaves as a polynomial of order epsilon sub 1 at the leading edge, and a polynomial of order epsilon sub 2 at the trailing edge. Epsilon sub 2 is a constant and epsilon sub 1 is varied over a range of practical interest. The magnitude of the additional thickness, y, is a second input parameter, and the effect of varying epsilon sub 1 and y on the aerodynamic performance of the airfoil was investigated. Results were obtained at a Mach number of 0.2 with an angle-of-attack of 6 degrees on the basic airfoils, and all calculations employ the full potential flow equations for two dimensional flow. The relaxation method of Jameson was employed for solution of the potential flow equations. Author

N75-24677*# North Carolina State Univ., Raleigh.
LIGHT AIRCRAFT LIFT, DRAG, AND MOMENT PREDICTION: A REVIEW AND ANALYSIS
Frederick O. Smetana, Delbert C. Summey, Neill S. Smith, and Ronald K. Carden Washington NASA May 1975 489 p refs
(Grant NGR-34-002-179)
(NASA-CR-2523) Avail: NTIS HC $12.00 CSCL 01A

The historical development of analytical methods for predicting the lift, drag, and pitching moment of complete light aircraft configurations in cruising flight is reviewed. Theoretical methods, based in part on techniques described in the literature and in part on original work, are developed. These methods form the basis for understanding the computer programs given to: (1) compute the lift, drag, and moment of conventional airfoils, (2) extend these two-dimensional characteristics to three dimensions for moderate-to-high aspect ratio unswept wings, (3) plot complete configurations, (4) convert the fuselage geometric data to the correct input format, (5) compute the fuselage lift and drag, (6) compute the lift and moment of symmetrical airfoils to M = 1.0 by a simplified semi-empirical procedure, and (7) compute, in closed form, the pressure distribution over a prolate spheroid at alpha = 0. Comparisons of the predictions with experiment indicate excellent lift and drag agreement for conventional airfoils and wings. Limited comparisons of body-alone drag characteristics yield reasonable agreement. Also included are discussions for interference effects and techniques for summing the results above to obtain predictions for complete configurations. Author

N75-24678*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LOW-SPEED AERODYNAMIC CHARACTERISTICS OF A 13-PERCENT THICK AIRFOIL SECTION DESIGNED FOR GENERAL AVIATION APPLICATIONS An Early Domestic Dissemination Report
Robert J. McGhee, William D. Beasley, and Dan M. Somers May 1975 57 p refs
(Proj. FEDD)
(NASA-TM-X-72697) Avail: NASA Industrial Applications Centers only to U.S. Requesters: HC $4.25/MF $2.25 CSCL 01A

Wind-tunnel tests were conducted to determine the low-speed section characteristics of a 13-percent-thick airfoil designed for general aviation applications. The results are compared with NACA 12-percent-thick sections and with the 17-percent-thick NASA airfoil. The tests are conducted over a Mach number range from 0.10 to 0.35. Chord Reynolds numbers vary from about 2 million to 9 million. Author

N75-24679*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COLD-AIR EXPERIMENTAL INVESTIGATION OF A TURBINE WITH BLADE TRAILING EDGE COOLANT EJECTION. 1: SINGLE-STAGE TURBINE
Harold J. Schum, Thomas P. Moffitt, Edward M. Szanca, and Frank P. Behning Washington Jun. 1975 39 p refs
(NASA-TM-X-3214; E8158) Avail: NTIS HC $3.75 CSCL 01A

Tests were made on a 0.762-meter-tip-diameter research turbine to determine the effect of blade coolant flow on its aerodynamic performance. Both stator and rotor blades had trailing-edge slots for coolant ejection. The turbine was tested over a range of speed and pressure ratio. High primary efficiencies, calculated on the basis of primary air only, were obtained. The efficiency attained was identical to that reported for the turbine from a previous investigation were only slotted stator blades where incorporated in the turbine and tested. And it also compares with results for the turbine with solid blading. Independently varying the rotor coolant flow showed that rotor cooling imposed a severe penalty on turbine efficiency. The thermodynamic efficiency, which accounts for the ideal energies of both blade coolant flows, decreased linearly with rotor coolant at a rate of about 0.7 percent per percent rotor coolant fraction. Author

N75-24680# Royal Aircraft Establishment, Farnborough (England).
AN EXPERIMENTAL INVESTIGATION ON THE TRANSONIC FLUTTER CHARACTERISTICS OF THE CANTILEVER SWEPT-BACK WING WITH AEROFOIL SECTION, AND COMPARISON WITH THE THIN CANTILEVER SWEPT-BACK WING
T. Morita, E. Nakai, and T. Kikuchi Mar. 1975 21 p refs Transl. into ENGLISH from the Japanese report NAL-TR-361
(RAE-Lib-Trans-1838; BR47558; NAL-TR-361) Avail: NTIS HC $3.25

Transonic flutter characteristics of a cantilever swept-back wing at Mach numbers from 0.756 to 0.978 were studied in a 60cm x 60cm transonic blow-down wind tunnel for comparison with those of the thin cantilever swept-back wing. The Reynolds numbers of the experiments were over about 1 million. The two wing models used, with and without a mass of engine pod attached, had a streamwise airfoil section, a sweep-back angle of 20 deg at the quarter-chord point and an aspect ratio and taper ratio of 8 and 0.4 respectively. The boundaries of flutter density and experimental flutter-speed coefficients are characterized by minimum values at Mach numbers in the vicinity of 0.9. The flutter characteristics resemble those from previous tests of flat-plate cantilever swept-back wings. It was found that the aerofoil section has a stabilizing effect except in the case of the wing with engine pod at the highest Mach numbers. Author

N75-24681*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ANALYSIS OF TRANSONIC FLOW ABOUT LIFTING WING-BODY CONFIGURATIONS
Richard W. Barnwell Washington Jun. 1975 73 p refs
(NASA-TR-R-440; L-9969) Avail: NTIS HC $4.25 CSCL 01A

An analytical solution was obtained for the perturbation velocity potential for transonic flow about lifting wing-body configurations with order-one span-length ratios and small reduced-span-length ratios and equivalent-thickness-length ratios. The analysis is performed with the method of matched asymptotic expansions. The angles of attack which are considered are small but are large enough to insure that the effects of lift in the region far from the configuration are either dominant or comparable with the effects of thickness. The modification to the equivalence rule which accounts for these lift effects is determined. An analysis of transonic flow about lifting wings with large aspect ratios is also presented. Author

N75-24682# European Space Research Organization, Paris (France).
PREDICTION OF UNSTEADY AIRLOADS FOR THE SOLUTION OF THE PANEL FLUTTER PROBLEM OF NOSECONES AND CONICAL SHELL STRUCTURES
K. L. Chao et al Mar. 1975 37 p refs Transl. into ENGLISH of "Berechnung der instationaeren Luftkraefte an harmonisch schwingenden spitzen Kreiskegelschalen mit kleinem Oeffnungswinkel", DFVLR, Goettingen, West Ger. Report DLR-FB-74-05, 1974 Original German report available from DFVLR, Porz, West Ger. 10.50 DM
(ESRO-TT-140; DLR-FB-74-05) Avail: NTIS HC $3.75

The unsteady airloads on harmonically oscillating nose cone structures were calculated for various vibration parameters using the slender body theory. Numerical results are presented as generalized airforces and are compared with corresponding results obtained by the piston theory. Author (ESRO)

N75-24683# European Space Research Organization, Paris (France).
DYNAMIC AND AEROELASTIC PROBLEMS OF STOP-ROTORS AND THEIR ANALYTICAL TREATMENT. PART 2: ANALYTICAL EQUATIONS AND SOLUTIONS
H. Foersching Mar. 1975 82 p refs Transl. into ENGLISH of "Dynamische u. aeroelastische Probleme des Stop-Rotors u. ihre anal. Behandlung. Teil 2: Anal. Ansaetze u. Loesungsverfahren", DFVLR, Goettingen, West Ger. Report DLR-FB-73-19, 1973 Original German report available from DFVLR, Porz, West Ger. 17.40 DM
(ESRO-TT-145-Pt-2; DLR-FB-73-19) Avail: NTIS HC $4.75

Based on previously derived, relationships the appropriate equations and solutions are presented for the analytical treatment of the dynamic and aeroelastic problems of stop-rotors of V/STOL aircraft. In particular, the problems of static torsional stability, flutter behavior, and gust loads on rotor blades occurring during the stop phase and during blade folding and retraction were investigated. Author (ESRO)

N75-24684# European Space Research Organization, Paris (France).
AERODYNAMIC FORCES ON A SIMPLE FUSELAGE/WING COMBINATION AT ANGLES OF ATTACK OF UP TO 50 DEG IN HYPERSONIC FLOW
Wolfgang Wyborny Mar. 1975 23 p refs Transl. into ENGLISH of "Aerodynamische Kraefte an einer einfachen Rumpffluegelkombination bei Anstellwinkeln bis 50 deg im Hyperschall", DFVLR, Porz, West Ger. Report DLR-Mitt-73-35, 31 Oct. 1973 Original German report available from DFVLR, Porz, West Ger. 11.30 DM
(ESRO-TT-146; DLR-Mitt-73-35) Avail: NTIS HC $3.25

The integrated forces acting on a simplified reentry configuration at Mach numbers of 8.8 and 13.5 were measured in a gun tunnel. The design of the internal strain gage balance for high normal forces (up to 300 N) with a small sting diameter (8 mm) is described. The measured results are compared with results obtained by a simple method of calculations. Author (ESRO)

N75-24685# European Space Research Organization, Paris (France).
INFLUENCE OF A PLAIN FLAP WITH A BLUNT, NOTCHED TRAILING EDGE ON THE LIFT OF A RECTANGULAR WING
M. Tanner Mar. 1975 20 p refs Transl. into ENGLISH of "Einfluss einer Woelbungsklappe mit stumpfer gebrochener Hinterkante auf den Auftrieb eines Rechteckfluegels", DFVLR, Goettingen, West Ger. Report DLR-FB-73-122, Oct. 1973 Original German report available from DFVLR, Porz, West Ger. 9 DM
(ESRO-TT-147; DLR-FB-73-122) Avail: NTIS HC $3.25

The influence of a plain flap with a blunt, notched trailing edge on the lift of a rectangular wing was investigated in a 3m wind tunnel. The results show that for all the investigated flap angles from 0 to 45 deg the maximum lift coefficient is greater than for a wing with a sharp trailing edge, while the flap efficiency coefficient is of approximately the same magnitude in both cases. Author (ESRO)

N75-24686# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
PROCEEDINGS (SUPPLEMENT), AFCRL 8TH SCIENTIFIC BALLOON SYMPOSIUM Biennial Report
Andrew S. Carten, Jr. Dec. 1974 286 p refs Proc. held at Hyannis, Mass., 30 Sep. - 3 Oct. 1974
(AF Proj. 6665)
(AD-A008489; AFCRL-TR-74-0596; AFCRL-SR-185) Avail: NTIS CSCL 01/3

This publication, in conjunction with the main volume, AFCRL-TR-74-0393, dated 21 August 1974, contains the papers presented at the Eighth AFCRL Scientific Balloon Symposium, 30 September to 3 October 1974, held at Hyannis, MA. The papers are grouped in accordance with the five symposium sessions: Powered Balloons, Tethered Balloons, Free Balloon Technology, Balloon-Borne Experiments, and Special Applications. GRA

N75-24687# Pennsylvania State Univ., University Park. Dept. of Aerospace Engineering.
THE EFFECTS OF UNCERTAINTIES ON PREDICTING ROTOR AND PROPELLER PERFORMANCE Final Technical Report M.S. Thesis
David V. Pauling May 1975 89 p refs
(Grant DAHC04-74-G-0051)
(AD-A008419; PSU-AERSP-75-3; ARO-12096-RTL) Avail: NTIS CSCL 01/1

A comparison is made of classical vortex theory with experimental and numerical results on statically thrusting propellers and rotors, and on propellers in forward flight. It is concluded that vortex theory can accurately predict the overall thrust and power of these propulsors when proper account is taken of normality between the vortex sheet and induced velocities in the wake. Further, it is necessary to include accurate airfoil section lift and drag coefficients as a function of Mach number and angle-of-attack in order to realize an accurate prediction. Also, although corrections to account for section thickness and wide-blade effects were found to be negligible, the prediction of rotor or propeller performance was found to depend rather strongly on the helix angle at the edge of the trailing-vortex sheet. GRA

N75-24688# ARO, Inc., Arnold Air Force Station, Tenn.
AN INVESTIGATION OF THE FLOW FIELD OF THE A-7D AIRCRAFT WITH SEVERAL EXTERNAL STORE LOADINGS AT MACH NUMBERS 0.70 AND 0.95 Final Report
J. B. Carman, Jr. Apr. 1975 79 p refs Prepared in cooperation with Arnold Eng. Develop. Center
(AD-A008476; AEDC-TR-75-15; AFATL-TR-75-21) Avail: NTIS CSCL 01/3

Wind tunnel tests were conducted using 0.05-scale models to study the flow field of the A-7D aircraft with several different external store load configurations. The flow-angularity data were obtained at selected axial, lateral, and vertical positions under the inboard, center, and outboard pylons of both wings of the aircraft. Parent aircraft angles of attack were 2, 6, and 10 deg at zero sideslip for free-stream Mach numbers of 0.70 and 0.95. GRA

N75-24689# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.
SUMMARY OF MIT RESEARCH ON DYNAMIC STALL AND BLADE-VORTEX INTERACTION, 1971 - 1974
Norman D. Ham Sep. 1974 28 p refs
(Contract DA-31-124-ARO(D)-247)
(AD-A008091; ASRL-TR-130-4; ARO-4846-17-E) Avail: NTIS CSCL 01/1

A previous MIT investigation indicated that during the close interaction of a vortex with a rotating blade, the measured vortex-induced unsteady loading on the blade differed greatly from that predicted by lifting-surface theory, both in peak magnitude and in chordwise distribution. The experimental results suggested the occurrence of local separation in the region of most intense vortex-induced loading. During the past year, blade-vortex interaction was studied by subjecting the midsection of a pressure-instrumented airfoil, mounted horizontally and perpendicular to the wind-tunnel airstream, to the impingement of a vortex moving periodically in the vertical plane from a point below the airfoil to a point above the airfoil and back again. The results of this investigation have shown that the maximum vortex-induced lift coefficients are of the order of 0.2 to 0.3. The vortex-induced peak loadings were found to be independent of the frequency of vortex impingement (i.e., vortex approach velocity), proportional to vortex strength, and only weakly dependent upon airfoil angle of attack and angle of yaw. GRA

N75-24690# California Inst. of Tech., Pasadena. Graduate Aeronautical Labs.
TURBULENT WAKE BEHIND A SELF-PROPELLED BODY Final Report, 1 Oct. 1972 - 30 Sep. 1973
Toshi Kubota 28 Mar. 1975 39 p refs
(Contract DAHC04-72-C-0029)
(AD-A008417; GALCIT-138; ARO-10869.1-E) Avail: NTIS CSCL 20/4

The wake behind a self-propelled body is studied for laminar and turbulent cases. For the laminar wake, asymptotic solutions are obtained with and without swirl. For the turbulent wake with the eddy-viscosity model, the solution is obtained from the laminar flow solution by transformation that reduces the turbulent-flow equation to the equation for laminar flow. With the mixing-length model for the turbulent shear stress, the far-wake solution becomes that of non-linear eigenvalue problem. These two models yield results that do not agree with experimental results. The far-wake solution is formulated based on a two-equation model for turbulent shear--turbulent energy and dissipation--with an additional assumption of negligible turbulence production from the mean flow. GRA

N75-24691# Ballistic Research Labs., Aberdeen Proving Ground, Md.
RIGIDLY ROTATING LIQUIDS IN CLOSED PARTIALLY-FILLED CYLINDRICAL CAVITIES
Nathan Gerber Mar. 1975 19 p refs
(AD-A008318; BRL-MR-2462) Avail: NTIS CSCL 19/4

This report presents a compilation of formulas for the following properties of a rigidly rotating liquid in a closed, partially-filled rectangular cylinder: (1) shape and location of the free surface, (2) location of the center of mass of the liquid, (3) moment of inertia and angular momentum of the liquid about the axis of the cylinder, (4) pressure distribution in the liquid, and (5) moment of inertia about a central transverse axis in the base of the cylinder. Six parameters are required: height and diameter of the cylinder, angular velocity of the cylinder, density of the fluid, precentage of fill, and gravitational or deceleration force per unit mass. Plots in non-dimensional form are presented for these quantities. GRA

N75-24692# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
AN/SSQ-41A/53 SONODROP FLOCELERATOR/DECELERATOR WIND TUNNEL TEST RESULTS
E. Gombos and E. A. Reed 24 Feb. 1975 27 p refs
(AD-A008560; DADC-72165-VT-A) Avail: NTIS CSCL 01/3

The Naval Air Development Center has conducted an analysis of aerodynamic decelerators for A-size sonobuoys. To obtain pertinent aerodynamic information, particularly drag data on various decelerators and flocelerators needed for mathematical simulation and future design, the Glenn L. Martin Institute of Technology Low Speed Wind Tunnel at the University of Maryland was utilized. This report summarizes the testing effort involved and presents the data for application to the refinement of current A-size sonobuoys. GRA

N75-24693# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala. Aeroballistics Directorate.
THEORETICAL DOWNWASH VELOCITIES ABOUT THE AH-1G HELICOPTER AT HOVER AND 140 KNOTS
Alma S. Marks 13 Dec. 1974 161 p
(DA Proj. 1M2-62303-A-214)
(AD-A008339; RD-75-21) Avail: NTIS CSCL 01/3

Current programs in helicopter armament have not adequately treated the problem of the rocket or missile's response to the aircraft's downwash. In this analysis, the downwash is represented as vortex filaments shed from the rotor tips, and the fuselage is represented by a source distribution. The vehicle and flight data and the downwash velocity components for hover and forward flight cases are given. GRA

N75-24694# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
AIR FORCE FLIGHT DYNAMICS LABORATORY FISCAL YEAR 1976 TECHNICAL OBJECTIVE DOCUMENT (TOD)
Jan. 1975 60 p Supersedes AFFDL-TR-73-41
(AD-A008087; AFFDL-TR-74-156; AFFDL-TR-73-41) Avail: NTIS CSCL 01/3

The document presents an overview of the six Technology Objectives and supporting technical goals for each that together constitute forward thinking of the Air Force Flight Dynamics Laboratory. Specific points of contact are identified at the end of each TO section. Information is largely based on the AFFDL fiscal 1976 technology plan omitting specific funding and timing information of an Official Use Only nature. Technology Objectives are described for flight vehicle structures, subsystems, flight control, flight mechanics, dynamics and technology integration, spanning the FY 75 to FY 82 time period. GRA

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N75-24695*# Systems Technology, Inc., Hawthorne, Calif.
A PILOT RATING SCALE FOR VORTEX HAZARD EVALUATION
Roger H. Hoh Jun. 1975 33 p refs
(Contract NAS4-1952)
(NASA-CR-143836; TR-1025-4/1) Avail: NTIS HC$3.75 CSCL 01A

A pilot rating scale is developed for subjective assessment of hazard resulting from wake vortex encounter upsets. The development of the rating scale is based on a survey of 48 pilots regarding the semantic properties of various phrases and a choice of formats for the rating scale. The rating scale can be used to define a hazard/nonhazard boundary as well as to determine a measure of the hazard. Author

N75-24696*# United Air Lines, Inc., San Francisco, Calif.
THE OUT OF SERVICE GUEST PILOT EVALUATION OF THE TWO-SEGMENT NOISE ABATEMENT APPROACH IN THE BOEING B727-200
W. E. Nylen 30 Jan. 1974 85 p
(Contract NAS2-7208)
(NASA-CR-137625) Avail: NTIS HC $4.75 CSCL 20A

Guest pilot evaluation results of an approach profile modification for reducing ground level noise under the approach of jet aircraft runways are reported. Evaluation results were used to develop a two segmented landing approach procedure and equipment necessary to obtain pilot, airline, and FAA acceptance of the two segmented flight as a routine way of operating aircraft on approach and landing. Data are given on pilot workload and acceptance of the procedure. E.H.W.

N75-24697# Joint Publications Research Service, Arlington, Va.
TRANSCONTINENTAL FLIGHTS AND THE WIND
M. G. Nayshuller 20 Jun. 1975 9 p refs Transl. into ENGLISH from PRIORDA (Moscow), no. 4, Apr. 1975 p 94-98
(JPRS-65060) Avail: NTIS HC $3.25

The effects of jet streams on transcontinental air flights are investigated. Author

N75-24698# Mitre Corp., McLean, Va.
SAFETY-RELATED ENGINEERING AND DEVELOPMENT ACTIVITIES OF THE FEDERAL AVIATION ADMINISTRATION
Jerold M. Chaukin and Marvin E. Kay Mar. 1975 112 p
(Contract DOT-FA70WA-2448)
(AD-A008395; M75-24; FAA-EM-75-2) Avail: NTIS HC $5.25

The FAA's engineering and development (E&D) program directly related to the goal of improving air safety is defined. Those safety-related E&D activities are categorized to correspond with associated categories of aviation accidents/fatalities. Statistics on aircraft accidents/fatalities for the period January 1964 to December 1972 are presented for each category. A summary description of each safety-related E&D activity is presented including the safety-related goals, current status, and future plans. Funding, by category, is presented for FY72-FY75. Author

N75-24699# Air Force Weapons Lab., Kirtland AFB, N.Mex.
A RADAR AND DIRECT VISUAL STUDY OF THE HAZARD TO AIRCRAFT FROM BIRD MIGRATIONS IN THE SOUTHWEST Final Report, 1 Apr. 1972 - 31 Dec. 1973
Robert C. Beason Mar. 1975 19 p refs
(AD-A008198) Avail: NTIS CSCL 01/2

The increasing number of aircraft accidents caused by bird strikes while the aircraft is in flight is a concern of the Air Force. The report concentrates on the danger during low-altitude, high-speed missions as well as takeoffs and landings at a fixed base. Methods for obtaining data are discussed with results from locations throughout the U.S. and the data are presented to show the concentrated areas where birds migrate. Recommendations are made for a continuing study and methods for supplying flight-plan information that would avoid concentrated bird areas. GRA

N75-24700# Air Force Weapons Lab., Kirtland AFB, N.Mex.
A REVIEW OF THE INFLUENCE OF WEATHER ON BIRD MIGRATION Final Report, 15 Nov. 1973 - 15 Jun. 1974
Robert C. Beason Mar. 1975 40 p refs
(AD-A007910; AFWL-TR-74-196) Avail: NTIS CSCL 01/2

The literature review updates the work of Lack in 1960 on weather and passerine migration. Noted additions include data obtained with radar surveillance or tracking of birds as well as waterfowl, shorebird, and raptor migration. All orientation research using caged migrants has been omitted. Only research on free-flying birds is included. Although the internal physiology of the bird is important in the limitation and continuation of migration, it has been disregarded. The interested reader is referred to a recent review by Evans. The influence of weather on bird migration is essential to predicting bird-aircraft strike hazards, thus enabling avoidance of the hazards and the enhancement of flight safety. GRA

N75-24701# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
PAN AMERICAN WORLD AIRWAYS, INCORPORATED, BOEING 707-321C, N458PA, BOSTON, MASSACHUSETTS, NOVEMBER 1973 Aircraft Accident Report
2 Dec. 1974 120 p
(PB-239448/4; NTSB-AAR-74-16) Avail: NTIS HC$5.25 CSCL 01B

The Boeing 707-321C (N458PA) crash at Logan International Airport Boston, Massachusetts was investigated. Results indicate that the probable cause of the accident was the presence of smoke in the cockpit which was continuously generated, and uncontrollable. The smoke led to an emergency situation that culminated in loss of control of the aircraft during final approach, when the crew in uncoordinated action deactivated the yaw damper in conjunction with incompatible positioning of flight spoilers and wing flaps. It is explained that the spontaneous chemical reaction between leaking nitric acid, improperly packaged and stowed, and the improper sawdust packing surrounding the acid's package initiated the accident sequence. GRA

N75-24702# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
SIERRA PACIFIC AIRLINES, INCORPORATED CONVAIR 340/440, N4819C NEAR BISHOP, CALIFORNIA, 13 MARCH 1974 Aircraft Accident Report
10 Jan. 1975 34 p
(PB-239511/9; NTSB-AAR-75-1) Avail: NTIS HC $3.75 CSCL 01B

A Convair 340/440 crash near Bishop, California was investigated. The last recorded transmission from the flight indicated that the aircraft was climbing under visual flight rules. The aircraft crashed into a foothill of the White Mountains. The National Transportation Safety Board was unable to determine the probable cause of the accident, nor the reason why the flightcrew did not maintain a safe distance from hazardous terrain during night visual flight conditions. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N75-24703*# Research Triangle Inst., Research Triangle Park, N.C. Systems Engineering Dept.
STUDIES OF UNCONTROLLED AIR TRAFFIC PATTERNS, PHASE 1
E. G. Baxa, Jr., L. L. Scharf (Colorado State Univ., Fort Collins), W. H. Ruedger, J. A. Modi, S. L. Wheelock, and C. M. Davis Apr. 1975 136 p refs
(Contract NAS6-2312)
(NASA-CR-141397; RTI-43U-840) Avail: NTIS HC $5.75 CSCL 17G

The general aviation air traffic flow patterns at uncontrolled airports are investigated and analyzed and traffic pattern concepts are developed to minimize the midair collision hazard in uncontrolled airspace. An analytical approach to evaluate midair collision hazard probability as a function of traffic densities is established which is basically independent of path structure. Two methods of generating space-time interrelationships between terminal area aircraft are presented; one is a deterministic model to generate pseudorandom aircraft tracks, the other is a statistical model in preliminary form. Some hazard measures are presented for selected traffic densities. It is concluded that the probability of encountering a hazard should be minimized independently of any other considerations and that the number of encounters involving visible-avoidable aircraft should be maximized at the expense of encounters in other categories. Author

N75-24704# Royal Aircraft Establishment, Farnborough (England).
SUPPORTING THE VERTICAL CHANNEL OF AN INERTIAL PLATFORM BY A BAROMETRIC HEIGHT METER
H. Winter Mar. 1975 23 p refs Transl. into ENGLISH from the German Presented at the 1974 DGON Symp. on Gyro Technol., Heidelberg
(RAE-Lib-Trans-1795; BR47557) Avail: NTIS HC $3.25

A description is given of the mixing of height derived from barometric pressure measurements with height derived from inertial measurements using a conventional height loop and also using a Kalman filter. The height obtained from the mixing loop during flight is compared with a reference height and error curves are given. The reference height is generated by a Kalman filter mix of barometric, inertial and ground based radar measured heights. Author

N75-24705# Sandia Labs., Albuquerque, N.Mex.
SOME OBSERVATIONS ABOUT THE STEERAD RADAR LOCATION ESTIMATION AND GUIDANCE SYSTEM
J. A. Cooper Jan. 1975 13 p refs
(Contract AT(29-1)-789)
(SAND-75-0030) Avail: NTIS HC $3.25

Knowledge on the STEERAD radar location estimation and guidance system is assessed. The assessment is based largely on recent analysis of experimental data, on theoretical treatments, and on computer modeling results. Author (NSA)

N75-24706# IBM Federal Systems Div., Owego, N.Y.
HIGH ALTITUDE NAVIGATION SYSTEM STUDY. VOLUME 1: SYSTEM SUMMARY REPORT Final Report, Jun. 1974 - Mar. 1975
Douglas H. Aldrich, John E. Feavearyear, and Norman F. Toda Mar. 1975 33 p refs 6 Vol.
(Contract F04701-74-C-0565)
(AD-A008482; IBM-75-L74-H1-Vol-1;
SAMSO-TR-75-72-Vol-1) Avail: NTIS CSCL 17/7

Analysis and simulation of a Passive Ranging Interferometer Sensor (PRAIS) used to provide autonomous navigation of spacecraft at average altitudes greater than 5000 nm was conducted. Navigation accuracy of a High Altitude Navigation System (HANS), configured with the PRAIS in conjunction with a digital computer and an Altitude Determination System (ADS), was evaluated for five orbits spanning the altitude range of 400 to 150,000 nm. Performance of this HANS configuration was demonstrated with Monte Carlo simulation using order statistics. GRA

N75-24707# IBM Federal Systems Div., Owego, N.Y.
HIGH ALTITUDE NAVIGATION SYSTEM STUDY. VOLUME 2: SYSTEM CONFIGURATION TRADE STUDIES REPORT Final Report, Jun. 1974 - Mar. 1975
Douglas H. Aldrich, John E. Feavearyear, and Norman F. Toda Mar. 1975 46 p refs 6 Vol.
(Contract F04701-74-C-0565)
(AD-A008483; IBM-74-L74-H5-Vol-2;
SAMSO-TR-75-72-Vol-2) Avail: NTIS CSCL 17/7

This report describes the system configuration trade studies analyses, defines critical system parameters, documents the results and selects a high altitude navigation system concept. During this Task 1 effort two basic system configurations were analyzed and their sensitivity to landmark parameters and tracking schedule established. The first of these configurations is based on the Interferometric Landmark Tracker (ILT) studied and tested under the Autonomous Navigation Technology ANT Contracts; the second configuration adds a passive ranging capability to the ILT. These systems are described in Section 2.0. The results obtained using a covariance analysis program are presented in Section 3.0 and indicate the feasibility of the Passive Ranging Interferometer Sensor (PRAIS) concept. Critical parameters are identified in Section 4.0. Section 5.0 describes the system selection. GRA

N75-24708# IBM Federal Systems Div., Owego, N.Y.
HIGH ALTITUDE NAVIGATION SYSTEM STUDY. VOLUME 3: PASSIVE RANGING INTERFEROMETER SENSOR (PRAIS) SPECIFICATION, PART 1 Final Report, Jun. 1974 - Mar. 1975
Douglas H. Aldrich, John E. Feavearyear, and Norman F. Tado Mar. 1975 14 p refs 6 Vol.
(Contract F04701-74-C-0565)
(AD-A008484; IBM-74-L74-H4-Vol-3-Pt-1;
SAMSO-TR-75-72-Vol-3-Pt-1) Avail: NTIS CSCL 17/7

This specification establishes the requirements for performance, design, test, and qualification of one mission-design-series of equipment identified as the Passive Ranging Interferometer Sensor (PRAIS) This CEI is used to provide the terrestial reference essential to the High Altitude Navigation system (HANS) for precise spacecraft navigation. This CEI requires RF radiation from ground radars of known location operating in the E/F frequency band. GRA

N75-24709# IBM Federal Systems Div., Owego, N.Y.
HIGH ALTITUDE NAVIGATION SYSTEM STUDY. VOLUME 4: SYSTEM PRELIMINARY DESIGN DESCRIPTION Final Report, Jun. 1974 - Mar. 1975
Douglas H. Aldrich, John E. Feavearyear, and Norman F. Toda Mar. 1975 126 p refs 6 Vol.
(Contract F04701-74-C-0565)
(AD-A008485; IBM-75-L74-H6-Vol-4;
SAMSO-TR-75-72-Vol-4) Avail: NTIS CSCL 17/7

This document is Volume 4 of the High Altitude Navigation System (HANS) study - System Preliminary Design Description. This volume describes the system studied by IBM to provide autonomous navigation for high altitude spacecraft. This spacecraft system concept consists of a Passive Range Interferometer Sensor (PRAIS) which provides precise angle tracking of and ranging to known radar landmarks, a digital computer to process the sensor data in a 19 state Kalman filter, and an attitude determination system. GRA

N75-24710# IBM Federal Systems Div., Owego, N.Y.
HIGH ALTITUDE NAVIGATION SYSTEM STUDY. VOLUME 5: SENSITIVITY ANALYSIS REPORT Final Report, Jun. 1974 - Mar. 1975
Douglas H. Aldrich, John E. Feavearyear, and Norman F. Toda Mar. 1975 22 p 6 Vol.
(Contract F04701-74-C-0565)
(AD-A008486; IBM-74-L74-H6-Vol-5;
SAMSO-TR-75-72-Vol-5) Avail: NTIS CSCL 17/7

This report, Volume 5 of the High Altitude Navigation System (HANS) Study, presents the sensitivity analyses carried out on the selected HANS system. Two Passive Range Interferometer Sensor (PRAIS) sensitivity analyses were conducted, one assuming atomic clock control of radar PRI, and one assuming crystal clock stability typical of MTI radars. Sensitivity data for the five study orbits is presented in terms of percent change in position error from the position error under nominal system (error) conditions. In these analyses two landmarks were tracked simultaneously, one with both passive ranging and interferometer landmark tracker (ILT) - the other with only the ILT. GRA

N75-24711# IBM Federal Systems Div., Owego, N.Y.
HIGH ALTITUDE NAVIGATION SYSTEM STUDY. VOLUME 6: SYSTEM PERFORMANCE DEMONSTRATION REPORT Final Report, Jun. 1974 - Mar. 1975
D. H. Aldrich, J. E. Feavearyear, and N. F. Toda Mar. 1975 32 p refs 6 Vol.
(Contract F04701-74-C-0565)
(AD-A008487; IBM-75-L74-H2-Vol-6;
SAMSO-TR-75-72-Vol-6) Avail: NTIS CSCL 17/7

The studies conducted under this phase O HANS Study contract evaluated the performance of a Passive Ranging Interferometer Sensor (PRAIS) when used for autonomous navigation of high altitude spacecraft. The autonomous navigation system investigated consisted of the PRAIS, a digital computer and an Attitude Determination System (ADS). Performance of this HANS is five orbits encompassing a range of orbital altitudes from 400 to 150,000 nm was evaluated using covariance analysis for the trade studies and parametric sensitivity analyses. HANS performance in a synchronous equatorial orbit and highly eccentric (Molniya) orbit was demonstrated via a Monte Carlo simulation using order statistics. GRA

N75-24712# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
EVALUATION OF A PROPOSED INS KALMAN FILTER IN A DYNAMIC FLIGHT ENVIRONMENT M.S. Thesis
Jerry E. Hammett Dec. 1974 187 p refs
(AD-A008472; GE/EE/74-45) Avail: NTIS CSCL 17/7

A proposed Kalman filter for an advanced manned aircraft is evaluated under simulated flight profiles which include straight and level and maneuvering flight. The aided inertial navigation system is represented by a 54-state linear system error model and filter by a 17-state error model with decoupled horizontal and vertical channel mechanization. The simulated flight profiles include two hours of straight and level flight and one hour of either straight and level or maneuvering flight. A comparison of filter effectiveness with the optimal filter is made for the two hour straight and level flight. The decoupled 17-state filter effectiveness is evaluated during one additional hour of maneuvering flight based on the filter performance in straight and level flight for the same time period. An error budget is determined for both flight profiles. GRA

N75-24713# Radio Corp. of America, Cape Kennedy, Fla.
A PROPOSAL FOR THE POSITION LOCATION OF REMOTE VEHICLES
E. E. Sheppard 23 Jan. 1974 63 p refs
(Contract F08606-74-C-0025)
(AD-A008283; RCA/TELTA-TR-74-045; AFETR-TR-75-14) Avail: NTIS CSCL 17/7

Most municipal and government agencies have a continuing need to track and locate ground vehicles operating within city limits, on main highways, and in off-road terrain. The signals from the individual units when received by the central agency should be continuously plotted so that the real-time location of the vehicles would always be known by central control. The objective of this study was to prepare and demonstrate the operation of the Night Dial equipment position locating and tracking capability using a balloonborne electonic relay. The basic elements of the feasibility demonstration include the balloon, the balloonborne telemetry receive/transmit relay, and the Night Dial sensor in the mobile ground vehicle. GRA

N75-24714# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
DIGITAL IMUE STUDY Final Report, Dec. 1973 - Jun. 1974
Edmund R. Foster and Robert H. Comstock Sep. 1974 86 p refs
(Contract F04701-73-C-0019)
(AD-A008184; R-841; SAMSO-TR-75-87) Avail: NTIS CSCL 17/7

Three applications of digital technology to an Inertial Measurement Unit (IMU) were studied - the stabilization servo, sinewave generation, and temperature control. The SHIP (Small Hardened Inertial Platform) served as a vehicle for this study, but the techniques developed are applicable to a wide range of guidance systems. GRA

N75-24715# Planar Corp., Alexandria, Va.
IMPLICATIONS OF AUTOMATION FOR OPERATING AND STAFFING AN ADVANCED AIR TRAFFIC MANAGEMENT SYSTEM Final Report, Jan. - Jun. 1974
Larry L. Jenny and Kenneth A. Lawrence Aug. 1974 81 p
(Contracts DOT-TS-7989; DOT-TS-8402)
(PB-238423/8; DOT-TSC-OST-74-32) Avail: NTIS HC $4.75 CSCL 17G

The role of the air traffic controller in future system operations is expected to be substantially affected by the introduction of new automated features. A system concept in which most surveillance, control and communication tasks would be assigned to machine elements is discussed. The implications of a high level of automation in terms of manpower requirements and operational procedures are examined. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.
For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N75-24716* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
INSULATED ELECTROCARDIOGRAPHIC ELECTRODES Patent
Robert M. David (Tex. Technol. Univ., Lubbock) and William A. Portnoy, inventors (to NASA) (Tex. Technol. Univ., Lubbock) Issued 13 May 1975 8 p Filed 4 Apr. 1973 Supersedes N73-21151 (11 - 12, p 1374) Sponsored by NASA
(NASA-Case-MSC-14339-1; US-Patent-3,882,846; US-Patent-Appl-SN-347953; US-Patent-Class-128.2.06E; US-Patent-Class-128-2.06B; US-Patent-Class-128-DIG.4) Avail: US Patent Office CSCL 06B

An integrated system is disclosed including an insulated electrode and an impedance transformer which can be assembled in a small plastic housing and used for the acquisition of electrocardiographic data. The electrode may be employed without a paste electrolyte and may be attached to the body for extended usage without producing skin reaction. The electrode comprises a thin layer of suitable nontoxic dielectric material preferably deposited by radio frequency sputtering onto a conductive substrate. The impedance transformer preferably comprises an operational amplifier having an FET input stage connected in the unity gain configuration which provides a very low lower cut-off frequency, a high input impedance with a very small input bias current, a low output impedance, and a high signal-to-noise ratio. Official Gazette of the U.S. Patent Office

N75-24717*# Boeing Co., Seattle, Wash.
ADVANCED BEADED AND TUBULAR STRUCTURAL PANELS. VOLUME 2: FABRICATION
Max D. Musgrove and Russell F. Northrup [1974] 49 p refs
(Contract NAS1-10749)
(NASA-CR-132482) Avail: NTIS HC $3.75 CSCL 01B

A study was conducted to exploit the efficiency of curved elements in the design of lightweight structural panels under combined loads of axial compression, inplane shear, and bending. A summary of the total program (analysis, fabrication and test) is presented in document NASA CR-2514. Detailed descriptions of the analysis effort and of the panel tests are contained in supplementary documents NASA CR-132460 and NASA-CR-132515 respectively. Data are also given on the development of economical fabrication techniques to minimize the effects of fabrication limitations on optimum panel designs. Author

N75-24718*# General Dynamics/Convair, San Diego, Calif.
COMPUTER PROGRAM TO ASSESS IMPACT OF FATIGUE AND FRACTURE CRITERIA ON WEIGHT AND COST OF TRANSPORT AIRCRAFT
C. J. Tanner, G. S. Kruse, and B. H. Oman Jun. 1975 109 p refs
(Contract NAS1-12506)
(NASA-CR-132648) Avail: NTIS HC $5.25 CSCL 01C

A preliminary design analysis tool for rapidly performing trade-off studies involving fatigue, fracture, static strength, weight, and cost is presented. Analysis subprograms were developed for fatigue life, crack growth life, and residual strength; and linked to a structural synthesis module which in turn was integrated into a computer program. The part definition module of a cost and weight analysis program was expanded to be compatible with the upgraded structural synthesis capability. The resultant vehicle design and evaluation program is named VDEP-2. It is an accurate and useful tool for estimating purposes at the preliminary design stage of airframe development. A sample case along with an explanation of program applications and input preparation is presented. Author

N75-24719*# Lockheed-California Co., Burbank.
FLIGHT SERVICE EVALUATION OF PRD-49/EPOXY COMPOSITE PANELS IN WIDE-BODIED COMMERCIAL TRANSPORT AIRCRAFT Annual Flight Service Evaluation Report
John H. Wooley Jul. 1974 14 p
(Contract NAS1-11621)
(NASA-CR-132647; LR-26580) Avail: NTIS HC $3.25

Fairing panels were fabricated to evaluate the fabrication characteristics and flight service performance of PRD-49 (Kevlar-49) a composite reinforcing material and to compare it with the fiberglass which is currently in use. Panel configurations were selected to evaluate the PRD-49 with two resin matrix materials in sandwich and solid laminate construction. Left and right hand versions of these configurations were installed on L-1011's which will accumulate approximately 3000 flight hours per year per aircraft. The direct substitution of PRD-49 for fiberglass produced a twenty-six percent weight reduction on the panel configurations. Examination of these panels revealed that there was no visible difference between the PRD-49 and adjacent fiberglass panels. Author

N75-24720*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NASA/ARMY XV-15 TILT ROTOR RESEARCH AIRCRAFT FAMILIARIZATION DOCUMENT
Jan. 1975 105 p Prepared in cooperation with Army Air Mobility R and D Lab., Moffett Field, Calif.
(NASA-TM-X-62407; A-5870) Avail: NTIS HC $5.25 CSCL 01C

The design features and general characteristics of the NASA/Army XV-15 tilt rotor research aircraft are described. This aircraft was conceived as a proof-of-concept vehicle and a V/STOL research tool for integrated wind tunnel, flight-simulation, and flight-test investigations. Discussions of special design provisions and safety considerations necessary to perform these missions are included in this report. In addition to predictions of aircraft and engine performance for the hover, helicopter, and airplane flight modes, analytical estimates of the structural and dynamic limitations of the XV-15 are provided. Author

N75-24721*# Foster-Miller Associates, Inc., Waltham, Mass.
DYNAMIC HEAVE-PITCH ANALYSIS OF AIR CUSHION LANDING SYSTEMS
K. M. Captain, A. B. Boghani, and D. N. Wormley Washington NASA May 1975 200 p
(Contract NAS1-12403)
(NASA-CR-2530) Avail: NTIS HC $7.00 CSCL 01B

A program to develop analytical tools for evaluating the dynamic performance of Air Cushion Landing Systems (ACLS) is described. The heave (vertical) motion of the ACLS was analyzed, and the analysis was extended to cover coupled heave-pitch motions. The mathematical models developed are based on a fundamental analysis of the body dynamics and fluid mechanics of the aircraft-cushion-runway interaction. The air source characteristics, flow losses in the feeding ducts, trunk and cushion, the effects of fluid compressibility, and dynamic trunk deflections, including ground contact are considered. A computer program, based on the heave-pitch analysis, was developed to simulate the dynamic behavior of an ACLS during landing impact and taxi over an irregular runway. The program outputs include ACLS motions, loadings, pressures, and flows as a function of time. To illustrate program use, three basic types of simulations were carried out. The results provide an initial indication of ACLS performance during (1) a static drop, (2) landing impact, and (3) taxi over a runway irregularity. Author

N75-24722*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LOW SPEED WIND TUNNEL TESTS ON A ONE-SEVENTH SCALE MODEL OF THE H.126 JET FLAP AIRCRAFT
Georgene H. Laub Apr. 1975 42 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Moffett Field, Calif.
(NASA-TM-X-62433; A-6074) Avail: NTIS HC $3.75 CSCL 01A

Low speed wind tunnel tests were performed on a one-seventh scale model of the British H.126 jet flap research aircraft over a range of jet momentum coefficients. The primary objective was to compare model aerodynamic characteristics with those of the aircraft, with the intent to provide preliminary data needed towards establishing small-to-full scale correlating techniques on jet flap V/STOL aircraft configurations. Lift and drag coefficients from the model and aircraft tests were found to be in reasonable agreement. The pitching moment coefficient and trim condition correlation was poor. A secondary objective was to evaluate a modified thrust nozzle having thrust reversal capability. The results showed there was a considerable loss of lift in the reverse thrust operational mode because of increased nozzle-wing flow interference. A comparison between the model simulated H.126 wing jet efflux and the model uniform pressure distribution wing jet efflux indicated no more than 5% loss in weight flow rate. Author

N75-24723*# Techtran Corp., Glen Burnie, Md.
INCREASING THE WEAR RESISTANCE OF AIRCRAFT PARTS
K. A. Krylov Washington NASA Oct. 1974 134 p refs Transl. into ENGLISH of the book "Povysheniye iznosostoykosti detaley samoletov" Moscow, Transport Press, 1974 144 p
(Contract NASw-2485)
(NASA-TT-F-15759) Avail: NTIS HC $5.75 CSCL 01C

The reasons for the insufficient wear resistance of moving parts of bolt and hinge joints in aircraft are examined. The results of investigations of the indicated aircraft parts are presented in connection with the occurrence of wear in their operation which is impermissible in amount and character. In addition, recommendations for increasing the wear resistance of parts are given. Author

N75-24724# Boeing Vertol Co., Philadelphia, Pa.
HEAVY LIFT HELICOPTER; CARGO HANDLING ATC PROGRAM. VOLUME 2: FABRICATION OF TEST HARDWARE AND FIXTURES INTEGRATED TEST RIG Final Report, Jun. 1971 - Jun. 1974
Joseph Shefrin and Wendell F. Hill Dec. 1974 218 p
(Contract DAAJ01-71-C-0840)
(AD-A007244; USAAMRDL-TR-74-97B-Vol-2) Avail: NTIS CSCL 01/3

This report formally documents the efforts and results of the cargo handling system segment of the Heavy Lift Helicopter (HLH) Advanced Technology Component (ATC) development program. The purpose of the HLH/ATC was to minimize technical, cost and schedule risks associated with future HLH system research development, test and evaluation (RDTE) and production programs. This was achieved by design, fabrication, and testing of specific ATC hardware in three critical air vehicle subsystems: rotor/drive system, flight control system, and cargo handling system. This report covers only the cargo handling system. GRA

N75-24725# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
ADVANCED MANEUVERABILITY OPTIONS FOR FUTURE FIGHTERS
Philip V. Kulwicki and James M. Sinnett Mar. 1975 35 p refs Presented at the Avionics Sect. Meeting, Amer. Defense Preparedness Assoc., Point Mugu, Calif., 20-21 Nov. 1974
(AF Proj. 7184)
(AD-A008497; AMRL-TR-74-140) Avail: NTIS CSCL 01/3

Recent developments in fighter design technology have emphasized air combat maneuverability. High thrust-to-weight ratio engines, advanced lightweight structures, improved aerodynamic efficiencies and effective flight control systems developments enable realization of more responsive, higher levels of air combat maneuverability than ever before seen in fighter aircraft. Parallel developments in high acceleration and advanced cockpit technologies within the aeromedical and engineering communities have illuminated the ability to realize significant improvements in performance levels for future tactical fighters. GRA

N75-24726# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
TOTAL AIRFRAME FATIGUE TEST F 104 G Final Report
Schutz 20 Mar. 1975 109 p Transl. into ENGLISH from Ind. Facilities Operations Corp. (West Germany), no. TF-81/20, 15 Mar. 1974 p 1-106
(AD-A007938; FTD-HC-23-0842-75) Avail: NTIS CSCL 01/3

The report contains the most important information and data on the experimental configuration, experimental sequence, and the results of the F 104 G total airframe fatigue experiment. Details are contained in 31 additional partial reports. In addition, the tables of Appendix B contain all the damage information which occurred on the structure during the experiments. This report can be used as a means of orientation for the information contained in the partial reports because of the cross references in the text and the tables. GRA

N75-24727# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
FLIGHT LOAD INVESTIGATION OF HELICOPTER EXTERNAL LOADS Final Report
Horace T. Hone Feb. 1975 75 p refs
(Contract DAAJ02-74-C-0016; DA Proj. 1F2-62203-AH-86)

(AD-A008394; SER-50906; USAAMRDL-TR-74-104) Avail: NTIS CSCL 01/3

Any cargo that is freely suspended from a helicopter fuselage, by any of several available methods, does not experience the same dynamic loads as the aircraft. For various reasons the load factors may be amplified and peak out of phase with those of the helicopter. This has long been suspected as a major contribution to premature failures in slings, pendants, and attachment points at the aircraft or cargo. A theoretical analysis of the load factor relationship during various flight maneuvers was conducted by Sikorsky Aircraft in 1971 by means of a hybrid computer simulation of the coupled motion of a CH-54 helicopter and several types of external loads, conducted in real time and nonreal time on a fixed-base and a moving-base simulator. Actual flight tests have now been performed on a CH-54 helicopter to investigate the validity of that part of the simulator program from which was derived the relationship between helicopter load factor and sling tension load factor. GRA

N75-24728# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
FUEL TANK NON-NUCLEAR VULNERABILITY TEST PROGRAM Final Report, Jan. 1973 - Feb. 1974
Allan J. Ferrenberg and Joel Blickenstaff Feb. 1975 141 p refs
(Contract F33615-73-C-0473; AF Proj. 3048)
(AD-A008531; AFAPL-TR-74-83) Avail: NTIS CSCL 01/3

The effort described was designed to obtain weapons: effects data on fuel tanks and their peripheral areas in support of an ASD non-nuclear survivability program. Specifically, the objectives of this program were to obtain data to assist in determining: (1) probabilities of fuel tank explosions, and (2) probabilities of fires in void areas adjacent to fuel tanks, caused by certain non-nuclear combat threats. An additional objective was to evaluate the effectiveness of the level of nitrogen inerting proposed for aircraft fuel tanks. GRA

N75-24729# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
GUIDE FOR THE DESIGN OF CONTROL STICKS IN VIBRATION ENVIRONMENTS Final Report
William H. Levison and Philip D. Houck Feb. 1975 154 p refs
(Contract F33615-74-C-4041)
(AD-A008533; BBN-6863; AMRL-TR-74-127) Avail: NTIS CSCL 01/3

A set of manual control experiments was conducted to determine the effects of control-stick parameters on tracking performance in a vibration environment. Preliminary experimental variables were stick design parameters, stick location, and presence or absence of vibration. Stick parameters had little effect on rms tracking error under vibration conditions for the particular aircraft dynamics that were used in this study. Considerable effect on control activity was observed, however, which suggests that stick design parameters will significantly influence overall performance in systems that respond at vibration frequencies. Stick lokation had no significant effect on either tracking or biodynamic performance measures. GRA

N75-24730# Boeing Commercial Airplane Co., Seattle, Wash.
TEST AND PERFORMANCE CRITERIA FOR AIRPLANE ANTISKID SYSTEMS Final Report, Dec. 1972 - Jun. 1974
H. H. Straub, N. S. Attri, and R. F. Yurczyk Oct. 1974 21 p
(Contract F33615-73-C-3017; AF Proj. 1369)
(AD-A008536; AFFDL-TR-74-118) Avail: NTIS CSCL 01/2

The basic components and operation of airplane antiskid systems are described. Test and performance criteria are established on a system as well as component level to support the development of a new brake control system. These criteria are established for the analog-hardware simulator, the dynamometer, and full airplane tests. GRA

N75-24731# Kamatics Corp., Bloomfield, Conn.
KAFLEX DRIVE SHAFT COUPLING FOR UH-1 HELICOPTER. DESIGN REFINEMENT Final Technical Report
Charles J. Wirth 1975 68 p refs
(Contract DAAJ01-72-C-0900)
(AD-A008365; KC-11174; USAAVSCOM-TR-74-76) Avail: NTIS CSCL 01/3

A KA flex coupling shaft, using flexing metal elements to accommodate misalignment has been designed as a replacement for the main drive shaft coupling of the UH-1 helicopter. Previous program phases explored the feasibility of this approach through analysis and test of a prototype coupling shaft. The program phases covered in this report include an examination of compatibility of the coupling shaft to the space envelope and operating conditions encountered in the UH-1 installation, and refinement of the prototype design to reflect the results of this and previous examinations. A mock up installation of the prototype coupling shaft is made, clearances are evaluated and lateral natural frequencies are measured and verified through analysis. GRA

N75-24732# Pisa Univ. (Italy). Inst. of Aeronautics.
THEORETICAL AND EXPERIMENTAL RESEARCH ON THE FATIGUE CRACK PROPAGATION IN STIFFENED PANELS, AN EVALUATION OF THE PARIS THEORY Final Technical Report
A. Salvetti, A. Frediani, E. Grassi, and F. Rossi Sep. 1974 83 p refs
(Contract DAJA37-73-C-2881)
(AD-A008079) Avail: NTIS CSCL 01/3

Research on the applicability of the Paris theory to aircraft riveted stiffened structures is reported. This research was carried out in two stages: evaluation of the stress intensity factor K in stiffened panels and measurement of crack growth rate in stiffened and unstiffened panels. GRA

N75-24733# LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
SAFEZONE ESCAPE ALERT SYSTEM DEVELOPMENT PROGRAM. PHASE 1: SYSTEM DEVELOPMENT
E. O. Cartwright 3 Mar. 1975 68 p refs
(Contract N62269-74-C-0523)
(AD-A008561; NADC-Cs-75029-40; Rept-2-57110/4R-3191) Avail: NTIS CSCL 01/3

A program was conducted to establish the basic value of a system designed to provide the aircrewman of an escape system equipped aircraft with a continuous indication of inflight escape capability. The system, as conceived, monitors aircraft dynamic conditions such as altitude, sink rate, and attitude, and provides this data to an onboard computer. Continuous computations are made and the results displayed to the aircrewman. Simulated flight envelopes were flown in a G degree-of-freedom moving base simulator. This included spin, attack, and flameout approach simulation. Two display concepts were evaluated; a digital read out of time remaining and an analog display with time remaining and rate of change displayed. Pilot performance was measured and pilot opinion was registered. GRA

N75-24734# Naval Surface Weapons Center, Dahlgren, Va.
AN ESTIMATE OF THE EFFECT OF MULTIPLE EJECTION RACK FLEXIBILITY ON SIX DEGREE OF FREEDOM STORE EJECTION CONDITIONS
Leroy Devan Mar. 1975 50 p refs
(AD-A008329; NSWC/DL-TR-3252) Avail: NTIS CSCL 01/3

A theoretical structural dynamic model of a MER (Multiple Ejection Rack), based upon BERNOULLI Pitch and yaw bending deflections and torsional rotation, is developed. Six-degree-of-freedom store ejection conditions are predicted. Sample computations were made for a M-117 bomb and constant aircraft pull-up rates corresponding to up to a 3.9 g normal acceleration. The computations were for the second, fourth, and sixth bombs dropped in the normal release sequence from an A-7D right wing center pylon station. Ejection velocities computed do not deviate more than 15% from the rigid case. Ejection pitching and rolling rates are affected more significantly by flexibility. However, the pull-up maneuver alone affects the ejection conditions to a greater extent than flexibility for most ejection variables and g values greater than 2. GRA

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N75-24735*# Decision Sciences Corp., Jenkintown, Pa.
ANALYSIS OF TECHNOLOGY REQUIREMENTS AND POTENTIAL DEMAND FOR GENERAL AVIATION AVIONICS SYSTEMS IN THE 1980'S Final Report
David M. Cohn, John H. Kayser, George M. Senko, and Donald R. Glenn Jun. 1974 223 p refs
(Contract NAS2-7888)
(NASA-CR-137629) Avail: NTIS HC $7.25 CSCL 01C

The trend for the increasing need for aircraft-in-general as a major source of transportation in the United States is presented (military and commercial aircraft are excluded). Social, political, and economic factors that affect the aircraft industry are considered, and cost estimates are given. Aircraft equipment and navigation systems are discussed. J.R.T.

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N75-24736* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
REVERSED COWL FLAP INLET THRUST AUGMENTOR Patent
Dah Yu Cheng, inventor (to NASA) (Santa Clara Univ.) Issued 13 May 1975 7 p Filed 19 Sep. 1973 Supersedes N73-32624 (11 - 23, p 2831) Sponsored by NASA
(NASA-Case-ARC-10754-1; US-Patent-3,883,095; US-Patent-Appl-SN-398886; US-Patent-Class-244-53B; US-Patent-Class-137-15.1) Avail: US Patent Office CSCL 21E

An adjustable airfoil is described for varying the geometry of a jet inlet and an ejector inlet in a jet engine for providing thrust augmentation and noise reduction. The airfoil comprises essentially a plurality of segments which are extended radially outward and retracted relative to the longitudinal axis of the engine as a function of a change in the pressure differential between the upstream and downstream surfaces of the airfoil. A servo mechanism responsive to the change in the pressure differential is coupled to the airfoil to extend and retract the airfoil segments to maintain the pressure at a maximum on the downstream side of the airfoil relative to the pressure on the upstream side of the airfoil. At low speeds, such as at take-offs and landings, the airfoil is fully extended while at high speeds it is fully retracted. Official Gazette of the U.S. Patent Office

N75-24737*# Boeing Commercial Airplane Co., Seattle, Wash.
THE 727 AIRPLANE TARGET THRUST REVERSER STATIC PERFORMANCE MODEL TEST FOR REFANNED JT8D ENGINES
C. T. P. Chow and E. N. Atkey Jul. 1974 195 p refs
(Contract NAS3-17842)
(NASA-CR-134652; Dg-41964) Avail: NTIS HC $7.00 CSCL 21E

The results of a scale model static performance test of target thrust reverser configurations for the Pratt and Whitney Aircraft JT8D-100 series engine are presented. The objective of the test was to select a series of suitable candidate reverser configurations for the subsequent airplane model wind tunnel ingestion and flight controls tests. Test results indicate that adequate reverse thrust performance with compatible engine airflow match is achievable for the selected configurations. Tapering of the lips results in loss of performance and only minimal flow directivity. Door pressure surveys were conducted on a selected number of lip and fence configurations to obtain data to support the design of the thrust reverser system. Author

N75-24738*# AiResearch Mfg. Co., Torrance, Calif.
HYPERSONIC RESEARCH ENGINE PROJECT. PHASE 2: SOME COMBUSTOR TEST RESULTS OF NASA AEROTHERMODYNAMIC INTEGRATION MODEL
Yung H. Sun, Albert E. Gaede, and Walter C. Sainio May 1975 26 p refs Presented at the 11th JANNAF Combustion Conf., Pasadena, Calif., 12 Sep. 1974
(Contract NAS1-6666)
(NASA-CR-132525; AiResearch-74-10818) Avail: NTIS HC $3.75 CSCL 21E

Combustor test results of the NASA Aerothermodynamic Integration Model are presented of a ramjet engine developed for operation between Mach 3 and 8. Ground-based and flight experiments which provide the data required to advance the technology of hypersonic air-breathing propulsion systems as well as to evaluate facility and testing techniques are described. The engine was tested with synthetic air at Mach 5, 6, and 7. The hydrogen fuel was heated to 1500 R prior to injection to simulate a regeneratively cooled system. Combustor efficiencies up to 95 percent at Mach 6 were achieved. Combustor process in terms of effectiveness, pressure integral factor, total pressure recovery and Crocco's pressure-area relationship are presented and discussed. Interactions between inlet-combustor, combustor stages, combustor-nozzle, and the effects of altitude, combustor step, and struts are observed and analyzed. Author

N75-24739*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRELIMINARY STUDY OF ADVANCED TURBOPROPS FOR LOW ENERGY CONSUMPTION
G. Kraft and W. Strack May 1975 48 p refs
(NASA-TM-X-71740; E-8371) Avail: NTIS HC $3.75 CSCL 21E

The fuel savings potential of advanced turboprops (operational about 1985) was calculated and compared with that of an advanced turbofan for use in an advanced subsonic transport. At the design point, altitude 10.67 km and Mach 0.80, turbine-inlet temperature was fixed at 1590 K while overall pressure ratio was varied from 25 to 50. The regenerative turboprop had a pressure ratio of only 10 and an 85 percent effective rotary heat exchanger. Variable camber propellers were used with an efficiency of 85 percent. The study indicated a fuel savings of 33 percent, a takeoff gross weight reduction of 15 percent, and a direct operating cost reduction of 18 percent was possible when turboprops were used instead of the reference turbofan at a range of 10 200 km. These reductions were 28, 11, and 14 percent, respectively, at a range of 5500 km. Increasing overall pressure ratio from 25 to 50 saved little fuel and slightly increased takeoff gross weight. Author

N75-24740*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLOW CHARACTERISTICS OF VARIOUS SWIRL-CAN MODULE DESIGNS
Edward J. Mularz Washington Jun. 1975 39 p refs Prepared in cooperation Army Air Mobility Research and Development Lab., Cleveland, Ohio
(NASA-TM-X-3236; E-8190) Avail: NTIS HC $3.75 CSCL 21E

Flow measurements were performed on each of six swirl-can combustor module designs under simulated combustor operating conditions to find the design which exhibited a small recirculation zone, intense air mixing, and good fuel distribution in its wake. Conditions that are favorable for producing low oxides of nitrogen emissions and high combustion efficiency were investigated. The recirculation zone, the turbulence intensity and the fuel distribution pattern are obtained in the wake region of the center module of a three module array. The most promising swirl-can module design incorporates two air swirlers which discharge air in opposite directions (contraswirl), mixes the fuel and air upstream of the inner swirler, and has a flow area blockage of 64.3% for the three module array. Author

N75-24741*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TURBINE DESIGN AND APPLICATION, VOLUME 3
Arthur J. Glassman, ed. Washington 1975 141 p refs
(NASA-SP-290-Vol-3; LC-79-185105) Avail: NTIS MF $2.25; SOD HC $2.10 CSCL 21E

Turbine technology concepts for thermodynamic and fluid dynamics are presented along with velocity diagrams, losses, mechanical design, operation and performance. Designs discussed include: supersonic turbines, radial-inflow turbines, and turbine cooling. F.O.S.

N75-24742*# AiResearch Mfg. Co., Torrance, Calif.
HYPERSONIC RESEARCH ENGINE PROJECT, PHASE 2. PRELIMINARY REPORT ON THE PERFORMANCE OF THE HRE/AIM AT MACH 6
Yung H. Sun and Walter C. Sainio May 1975 26 p refs
(Contract NAS1-6666)
(NASA-CR-132538; AiResearch-74-10951) Avail: NTIS HC $3.75 CSCL 21E

Test results of the Aerothermodynamic Integration Model are presented. A program was initiated to develop a hydrogen-fueled research-oriented scramjet for operation between Mach 3 and 8. The primary objectives were to investigate the internal aerothermodynamic characteristics of the engine, to provide realistic design parameters for future hypersonic engine development as well as to evaluate the ground test facility and testing techniques. The engine was tested at the NASA hypersonic tunnel facility with synthetic air at Mach 5, 6, and 7. The hydrogen fuel was heated up to 1500 R prior to injection to simulate a regeneratively cooled system. The engine and component performance at Mach 6 is reported. Inlet performance compared very well both with theory and with subscale model tests. Combustor efficiencies up to 95 percent were attained at an equivalence ratio of unity. Nozzle performance was lower than expected. The overall engine performance was computed using two different methods. The performance was also compared with test data from other sources. Author

N75-24743*# AiResearch Mfg. Co., Los Angeles, Calif.
HYPERSONIC RESEARCH ENGINE PROJECT. PHASE 2A: INSTRUMENTATION PROGRAM Interim Technical Report, 24 Aug. - 23 Nov. 1967
P. M. Parmar, ed. May 1975 75 p refs
(Contract NAS1-6666)
(NASA-CR-132593; AP-67-3020; ITR-3) Avail: NTIS CSCL 21E

Instrumentation developments are reported for thrust measurement, gas sampling, temperature measurement, pressure measurement, and systems engineering. Author

N75-24744*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
VIBRATION RESPONSES OF TEST STRUCTURE NO. 1 DURING THE EDWARDS AIR FORCE BASE PHASE OF THE NATIONAL SONIC BOOM PROGRAM
Donald S. Findley, Vera Huckel, and Herbert R. Henderson Jun. 1975 28 p ref
(NASA-TM-X-72706) Avail: NTIS HC $3.75 CSCL 13B

In order to evaluate reaction of people to sonic booms of varying overpressures and time durations, a series of closely controlled and systematic flight test studies were conducted in the vicinity of Edwards AFB, California, from June 3 to June 23, 1966. The dynamic responses of several building structures were measured as a part of these studies, and the measurements made in a one-story residence structure (Edwards test structure No. 1) are presented. Sample acceleration and strain recordings are presented from F-104, B-58, and XB-70 sonic-boom exposures, along with tabulations of the maximum acceleration and strain values measured for each one of about 140 flight tests. These data are compared with similar measurements for engine noise exposures of the building during simulated landing approaches and takeoffs of KC-135 aircraft. Author

N75-24745*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT ON FAN FLOW CHARACTERISTICS OF LENGTH AND AXIAL LOCATION OF A CASCADE THRUST REVERSER
Donald A. Dietrich Washington Jun. 1975 37 p refs
(NASA-TM-X-3247; E-8223) Avail: NTIS HC $3.75 CSCL 21E

A series of static tests were conducted on a model fan with a diameter of 14.0 cm to determine the fan operating characteristics, the inlet static pressure contours, the fan-exit total and static pressure contours, and the fan-exit pressure distortion parameters associated with the installation of a partial-circumferential-emission cascade thrust reverser. The tests variables included the cascade axial length, the axial location of the reverser, and the type of fan inlet. It was shown that significant total and static pressure distortions were produced in the fan aft duct, and that some configurations induced a static pressure distortion at the fan face. The amount of flow passed by the fan and the level of the flow distortions were dependent upon all the variables tested. Author

N75-24746*# National Aeronautics and Space Administratior Lewis Research Center, Cleveland, Ohio.
EXHAUST POLLUTANT EMISSIONS FROM SWIRL-CAN COMBUSTOR MODULE ARRAYS AT PARAMETRIC TEST CONDITIONS
Edward J. Mularz, Jerrold D. Wear, and Peter W. Verbulecz Washington Jun. 1975 33 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Cleveland, Ohio
(NASA-TM-X-3237; E-8196) Avail: NTIS HC $3.75 CSCL 21E

Improved designs of swirl-can combustor modules were tested using seven-module arrays in a combustor. The combustor was operated over a pressure range of 69 to 207 N/sq cm, a fuel-air ratio range of 0.015 to 0.046, at a constant inlet air temperature of 733 K, and at reference velocities of 23.9 and 30.6 m/sec. The three designs tested performed with high combustion efficiency at all conditions tested and exhibited oxides of nitrogen emissions substantially lower than that of conventional gas turbine combustors. A correlating parameter used to extrapolate oxides of nitrogen emissions to full power or takeoff conditions for large commercial turbofan engines predicts oxides of nitrogen emissions somewhat higher than those specified in the 1979 government emissions standards. Author

N75-24747*# TRW Equipment Labs., Cleveland, Ohio.
DEVELOPMENT OF IMPACT RESISTANT BORON/ ALUMINUM COMPOSITES FOR TURBOJET ENGINE FAN BLADES
P. Melnyk and I. J. Toth May 1975 93 p
(Contract NAS3-17763)
(NASA-CR-134770; ER-7806) Avail: NTIS HC $4.75 CSCL 21E

Composite fabrication was performed by vacuum press diffusion bonding by both the foil-filament array and preconsolidated monotape methods. The effect of matrix material, fiber diameter, matrix enhancement, fiber volume reinforcement, test temperature, angle-plying, notch, impact orientation, processing variables and fabrication methods on tensile strength and Charpy impact resistance are evaluated. Root attachment concepts, were evaluated by room and elevated temperature tensile testing, as well as by pendulum-Izod and ballistic impact testing. Composite resistance to foreign object damage was also evaluated by ballistic impacting of panels using projectiles of gelatin, RTV rubber and steel at various velocities, and impingement angles. A significant improvement in the pendulum impact resistance of B-Al composites was achieved. Author

N75-24748*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXPERIMENTAL FORCED VIBRATION RESPONSES OF TEST HOUSES DURING THE EDWARDS AIR FORCE BASE PHASE OF THE NATIONAL SONIC BOOM TEST PROGRAM
Huey D. Carden and William H. Mayes Jun. 1975 19 p refs
(NASA-TM-X-72705) Avail: NTIS HC $3.25 CSCL 13B

Experimental vibration studies were conducted on two houses to determine some of the dynamic response characteristics, resulting from sonic boom. The primary objectives of the vibration tests were to identify the mode shapes associated with the various frequencies determined from the sonic boom response data, and to obtain some basic information about the vibration behavior of buildings in general. The results are presented of forced sinusoidal vibration studies of some components of the test structures. Included are acceleration response data on selected walls, wall surface modal patterns, and vibration induced noise measurements at various locations in the test structures. Author

N75-24749# European Space Research Organization, Paris (France).
CURRENT ACTIVITIES IN THE AIR-BREATHING ENGINES SECTOR IN THE FEDERAL REPUBLIC OF GERMANY AND IN WEST BERLIN
Mar. 1975 37 p Transl. into ENGLISH of "Derzeitige Aktivitaeten auf dem Sektor der Luftatmenden Antriebe in der Bundesrep. u. in West-Berlin", DGLR, Cologne Report DLR-Mitt-74-16, 1974 Original German report available from ZLDI, Munich 7.60 DM
(ESRO-TT-139; DLR-Mitt-74-16) Avail: NTIS HC $3.75

A concise overall view of activities in the sector of air breathing engines is given with the aim of providing quick information, and informing readers on relevant experimental work presently being carried out in Federal Germany and West Berlin. Part A of the survey is arranged in order of industrial concerns, college independent research institutes, and college institutes. In part B, the same activities are grouped under the headings of the systems concerned. A part of the collective activities of the DGLR Engines Division is represented. Author (ESRO)

N75-24750# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
EVALUATION OF ELECTROSTATIC PROBE TECHNIQUE FOR DETECTION OF PARTICLES EMITTED DURING TURBINE ENGINE DISTRESS Final Report, 15 Jan. - 15 Mar. 1974
Donald A. Mitchell and Mario Soliz Nov. 1974 83 p refs
(AF Proj. 3066)
(AD-A008186; AFAPL-TR-74-41) Avail: NTIS CSCL 21/5

Electrostatic probes were inserted into the turbine exhaust of a J57 gas turbine engine in an effort to detect particles generated by artificially induced distresses of certain gas path components, thereby serving as an indication of incipient component failure. The two types of distresses induced were simulations of turbine rub and combustor burn, each of which is often accompanied by particle release into the gas flow. Results of this evaluation indicate that probe output signals due to particle impact with the probe could not be reliably detected above the baseline noise level for the distresses simulation in this effort. GRA

N75-24751# Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.
CLOSED-CIRCUIT REFUELING (CCR) Development Report, Feb. 1967 - Feb. 1973
Wayne E. Studebaker Sep. 1974 228 p refs
(DA Proj. 1J6-64717-DL-41)
(AD-A008330; USAMERDC-2110) Avail: NTIS CSCL 21/4

This report covers the design, development, test, and evaluation of a closed-circuit refueling nozzle and a gravity-fill adapter for use with the closed-circuit refueling nozzle. Closed-circuit refueling provides a means for mechanically attaching a fuel supply to the .fuel tank of an aircraft, vehicle or other item of power equipment to be refueled. Closed-circuit refueling was developed in conjunction with the Forward Area Refueling Equipment (FARE). The versatility of closed-circuit refueling will allow the concept to be applied to a wide variety of fuel-handling operations. GRA

N75-24752# TRW Systems Group, Redondo Beach, Calif.
CAPACITORS FOR AIRCRAFT HIGH POWER Final Report
C. L. Dailey and C. W. White Jul. 1974 56 p refs
(Contract F33615-73-C-2068)
(AD-A008000; AFAPL-TR-74-79) Avail: NTIS CSCL 10/3

Extensive life tests of several dielectric systems have shown that those best suited for pulse discharge energy storage capacitors requiring high energy storage density are paper/K-Film with castor oil (218 joules/pound of active storage volume at 100,000 shots life), paper/Kapton with MCS 1489 oil (120 joules/pound 100,000 shots), paper/polysulfone with silicon oil (94 joules/pound at 100,000 shots) and paper/polypropylene with MCS oil (97 joules/pound at 100,000 shots). All paper capacitors are promising but require further testing and an improved screening procedure to ensure reliability. K-Film is suitable for low pulse rates (a few shots per second) only while polypropylene is best suited for high pulse rates. For moderate pulse rates of a few hundred shots per second, and high temperature operation, both Kapton and polysulfone are attractive. Kapton has the higher energy storage density but polysulfone is considerably cheaper. GRA

N75-24753# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
A SIMPLIFIED METHOD FOR ASSESSING THE PERFORMANCE OF AN ENGINE IN THE ACCELERATION ROLE Final Report, 1969 - 1973
Edward T. Curran and M. Brian Bersten Feb. 1975 30 p refs
(AF Proj. 3012)
(AD-A008473; AFAPL-TR-74-73) Avail: NTIS CSCL 21/5

This report gives a simple analysis for assessing the relative importance of engine specific weight and specific fuel consumption for an acceleration engine. Such an engine may power the boost phase of a single-stage-to-orbit vehicle, the first stage of a multistage vehicle, or the acceleration phase of a hypersonic cruise vehicle; it is assumed that the performance of later stages is not relevant to the optimization. The major limitations of the method are the assumptions that the thrust/drag ratio and the specific fuel consumption are constant during the flight and the fact that no restriction is put on vehicle acceleration. However, within these limitations the analysis allows comparisons to be made over a wide range of engine types. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N75-24754# Honeywell, Inc., Minneapolis, Minn. Government and Aeronautical Products Div.
DIGITAL FLIGHT CONTROL SYSTEMS FOR TACTICAL FIGHTERS. VOLUME 3. DIGITAL FLIGHT CONTROL SYSTEM DESIGN CONSIDERATION Interim Report, Feb. 1972 - Jun. 1973
M. A. Bender, R. J. Gaabo, and F. L. Smith Jun. 1974 436 p
(Contract F33615-72-C-1058; AF Proj. 1987)
(AD-A002687; GAPD-F-0131-IR3; AFFDL-TR-73-119-Vol-3)
Avail: NTIS CSCL 01/4

For abstract, see N75-24757.

N75-24755# Cranfield Inst. of Technology (England).
ON THE ADEQUATE MODEL FOR AIRCRAFT PARAMETER ESTIMATION
V. Klein Mar. 1975 33 p refs
(Cranfield-Aero-28) Avail: NTIS HC $3.75

The problem of the selection of measured data from an aircraft of an adequate model which approximates the correct model and which facilitates the successful determination of unknown parameters is presented. Two ways for the proper model structure verification are recommended, namely sensitivity analysis and/or testing of a hypothesis as to the significance of unknown parameters in the model proposed, and the analysis of residuals. Some approaches towards the assessment of parameter and adequate model accuracies are proposed, and an example is shown. Author

N75-24756*# Stanford Univ., Calif.
EFFECTS OF ASYMMETRY ON THE DYNAMIC STABILITY OF AIRCRAFT Final Technical Report
R. E. Fantino, E. K. Parsons, J. D. Powell, and R. S. Shevell Jun. 1975 259 p refs
(Grant NGR-05-020-663)
(NASA-CR-142857) Avail: NTIS HC $8.50 CSCL 01C

The oblique wing concept for transonic aircraft was proposed to reduce drag. The dynamic stability of the aircraft was investigated by analytically determining the stability derivatives at angles of skew ranging from 0 and 45 deg and using these stability derivatives in a linear analysis of the coupled aircraft behavior. The stability derivatives were obtained using a lifting line aerodynamic theory and found to give reasonable agreement with derivatives developed in a previous study for the same aircraft. In the dynamic analysis, no instability or large changes occurred in the root locations for skew angles varying from 0 to 45 deg with the exception of roll convergence. The damping in roll, however, decreased by an order of magnitude. Rolling was a prominent feature of all the oscillatory mode shapes at high skew angles. Author

N75-24757# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
DIGITAL FLIGHT CONTROL SYSTEM FOR TACTICAL FIGHTERS Final Report, Feb. 1972 - Dec. 1973
A. Ferit Konar, Robert J. Gaabo, Marv A. Bender, Fred L. Smith, and James D. Wolf Jul. 1974 424 p
(Contract F33615-72-C-1058; AF Proj. 1987)
(AD-A002686; F0121-IR1; AFFDL-TR-74-69) Avail: NTIS CSCL 01/3

The Digital Flight Control Systems for Tactical Fighters Program is a development program the objective of which is to define the technology necessary to apply digital flight control techniques to the three-axis, multiple flight control configuration demands of advanced fighter aircraft. Analysis efforts have defined powerful analytical DF CS models and computer program tools which permit determination of flight control system performance as a function of computational parameters -- word length, sample rate, and computational delays. An exercise of the programs using the F-4 as a model indicated 100 iterations per second as satisfactory for the longitudinal axis. For Vol. 11, see N75-20349. GRA

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N75-24758* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LOW SPEED PHASELOCK SPEED CONTROL SYSTEM Patent
Robert W. Fulcher and John Sudey, inventors (to NASA) Issued 13 May 1975 10 p Filed 27 Sep. 1973 Supersedes N74-10202 (12 - 01, p 0026)
(NASA-Case-GSC-11127-1; US-Patent-3,883,785; US-Patent-Appl-SN-401466; US-Patent-Class-318-314; US-Patent-Class-318-318; US-Patent-Class-318-341) Avail: US Patent Office CSCL 09A

A motor speed control system for an electronically commutated brushless dc motor is provided which includes a phaselock loop with bidirectional torque control for locking the frequency output of a high density encoder, responsive to actual speed conditions, to a reference frequency signal, corresponding to the desired speed. The system includes a phase comparator, which produces an output in accordance with the difference in phase between the reference and encoder frequency signals, and an integrator-digital-to-analog converter unit, which converts the comparator output into an analog error signal voltage. Compensation circuitry, including a biasing means, is provided to convert the analog error signal voltage to a bidirectional error signal voltage which is utilized by an absolute value amplifier, rotational decoder, power amplifier-commutators, and an arrangement of commutation circuitry. Official Gazette of the U.S. Patent Office

N75-24759*# Avionics, Inc., Sunnyvale, Calif.
PRELIMINARY ANALYSIS OF SEVERAL MICROWAVE LANDING SYSTEM FLARE ELEVATION CONFIGURATIONS
T. Goka May 1975 19 p
(Contract NAS2-8380)
(NASA-CR-137673) Avail: NTIS HC $3.25 CSCL 01E

Configurations of MLS Flare Elevation Systems that can be considered reasonable and practical in actual implementation are identified. Each of these are analyzed and compared with respect to (1) computational requirement, (2) required coverage, and (3) accuracy including altitude and sink-rate estimation error performance. Author

N75-24760*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SHUTTLE SPACELAB SIMULATION USING A LEAR JET AIRCRAFT: MISSION NO. 3 (ASSESS PROGRAM)
John O. Reller, Jr., Carr B. Neel, and Robert H. Mason Nov. 1974 145 p refs
(NASA-TM-X-62410; A-5907) Avail: NTIS HC $5.75 CSCL 14B

The third ASSESS mission using a Lear Jet aircraft conducted to continue the study of scientific experiment operations in a simulated Spacelab environment. Prior to the mission, research planning and equipment preparation were observed and documented. A flight readiness review for the experiment was conducted. Nine of the ten scheduled flights were completed during simulation mission and all major science objectives were accomplished. The equipment was well qualified for flight and gave little trouble; telescope malfunctions occurred early in the mission and were corrected. Both real-time and post-observation data evaluation were used to assess research progress and to plan subsequent flight observations for maximum effectiveness. Author

N75-24761*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HEADS UP DISPLAY FOR THE FLIGHT SIMULATOR FOR ADVANCED AIRCRAFT (FSAA)
David H. Brocker and Bruce C. Ganzler Jan. 1975 16 p refs
(NASA-TM-X-62416; A-5959) Avail: NTIS HC $3.25 CSCL 14B

A heads-up flight director display designed for a V/STOL lift-fan transport simulation study is described. The pilot's visual flight scene had the heads-up display optically superimposed over the usual out-the-window, video flight scene. The flight director display required the development and integration of a flexible, programmable display generator, graphics assembler, display driver, computer interface system, and special collimating optics for the pilot's flight scene. The optical overlay was realistic because both scenes appeared at optical infinity, and the flexibility of this display device establishes its value as a research tool for use in future flight simulation programs. Author

N75-24762*# International Business Machines Corp., Huntsville, Ala. Space Systems.
FLIGHT SIMULATION FOR FLIGHT CONTROL COMPUTER S/N 0104-1 (ASTP) Final Report
5 May 1975 296 p
(Contract NAS8-14000)
(NASA-CR-143851; IBM-75W-00077) Avail: NTIS HC $8.75 CSCL 14B

Flight control computer (FCC) 0104-I has been designated the prime unit for the SA-210 launch vehicle. The results of the final flight simulation for FCC S/N 0104-I are documented. These results verify satisfactory implementation of the design release and proper interfacing of the FCC with flight-type control sensor elements and simulated thrust vector control system. Author

N75-24763*# Rose-Hulman Inst., Terra Haute, Ind. Dept. of Mechanical and Civil Engineering.
MATERIALS AND CONSTRUCTION TECHNIQUES FOR CRYOGENIC WIND TUNNEL FACILITIES FOR INSTRUCTION/RESEARCH USE
Stephen Fredrick Morse and Alan Thomas Roper Jun. 1975 72 p refs
(Grant NsG-1154)
(NASA-CR-142955; ME-75-1-SFM/ATR) Avail: NTIS HC $4.25 CSCL 14B

The results of the cryogenic wind tunnel program conducted at NASA Langley Research Center are presented to provide a starting point for the design of an instructional/research wind tunnel facility. The advantages of the cryogenic concept are discussed, and operating envelopes for a representative facility are presented to indicate the range and mode of operation. Special attention is given to the design, construction and materials problems peculiar to cryogenic wind tunnels. The control system for operation of a cryogenic tunnel is considered, and a portion of a linearized mathematical model is developed for determining the tunnel dynamic characteristics. Author

N75-24764*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE EFFECT OF MEASUREMENT ERRORS AND COMPUTATIONAL APPROXIMATIONS ON A PERSPECTIVE ILM RADAR IMAGE
W. Thomas Bundick [1975] 151 p
(NASA-TM-X-72685) Avail: NTIS HC $6.25 CSCL 01E

The effect was examined of aircraft position and attitude, of measurement errors, and of computational approximations on the size, shape, and position of a perspective radar image of an airport runway as might be displayed by an independent landing monitor in transport aircraft. The effect on runway image geometry was examined for different aircraft attitudes and different aircraft positions relative to a standard three degree glide slope. Measurement errors investigated were errors in radar azimuth angle and range, and errors in those aircraft parameters supplied to the radar for use in converting the radar image into a perspective format (namely pitch, roll, and altitude). Also investigated were the effects of using certain mathematical approximations, such as small angle, in the coordinate transformation which converts the image to a perspective format. Author

N75-24765# Civil Aeromedical Inst., Oklahoma City, Okla.
COMPARISON OF OPA LOCKA TOWER WITH OTHER ATC FACILITIES BY MEANS OF A BIOCHEMICAL STRESS INDEX Final Report
C. E. Melton, J. M. McKenzie, J. T. Saldivar, Jr., and S. M. Hoffmann Dec. 1974 14 p refs
(AD-A008378; FAA-AM-74-11) Avail: NTIS HC $3.25

Physiological and biochemical measurements of stress in 14 Opa Locka Tower (OPF) controllers indicated that the principal stressor at that facility was the heavy volume of air traffic. Controllers respond to this stressor with a large increase in urinary output of catecholamines. A stress index shows that OPF ranks second in stressfulness in the nine stress studies carried out at eight facilities. Baseline values show that off-duty stress at OPF is low. The results of the study emphasize that a battery of tests is necessary for adequate definition of stress in this personnel group. Author

N75-24766# Sandia Labs., Albuquerque, N.Mex.
WIND TUNNEL PRESSURE PROBES: NEW CALIBRATIONS FOR NEW GEOMETRIES AND FLOW ENVIRONMENTS
C. W. Peterson and O. L. George Jun. 1975 31 p refs
Backup document for AIAA Synoptic scheduled for publication in AIAA Journal in Oct. 1975
(Contract AT(29-1)-789)
(SAND-75-0337) Avail: NTIS HC $3.75

Extensive calibrations of Pitot, static, and cone-static pressure probes were performed for new probe geometries over a wide range of flow conditions so that routine, accurate flow field measurements can be made in wind tunnels. Calibration data were obtained over a wide range of Mach number and free stream Reynolds number in hypersonic wind tunnels and in an open-jet facility. Flat-tipped Pitot probes were calibrated for viscous and rarefaction phenomena. A correlation was derived which relates these flat probe results to round probe data over a typical range of flat probe aspect ratios. These probes were also calibrated for the effects of pitch and yaw in inviscid, viscous, and rarefied flow conditions. Calibrations of static and cone-static pressure probes were extended to values of the hypersonic viscous interaction parameter approaching nine. Present results revealed that the sensitivity of these probes to tip geometry and flow gradients may restrict their use in hypersonic flows. Author

N75-24767# Air Force Civil Engineering Center, Tyndall AFB, Fla.
PROCEDURE FOR THE NON-DESTRUCTIVE EVALUATION OF FLEXIBLE AIRFIELD PAVEMENTS Final Report, Oct. 1972 - Jan. 1975
Douglas I. Hanson Jan. 1975 58 p refs
(AD-A008475; AFCEC-TR-75-1) Avail: NTIS CSCL 01/5

A procedure for the non-destructive evaluation of flexible airfield pavements is presented. The procedure consists of accomplishing a condition survey using a mechanistic procedure and the accomplishment of a deflection study using a Benkelman Beam and an aircraft at close to maximum load. Procedures are developed and presented for use in the prediction of either the allowable aircraft gross load at specified operational levels or the prediction of the allowable coverage levels at specified gross loadings. GRA

N75-24768# Air Force Human Resources Lab., Brooks AFB, Tex.
T-46 SIMULATOR AND T-4 GROUND TRAINING DEVICES IN USAF UNDER GRADUATE PILOT TRAINING Final Report, Feb. 1972 - Jun. 1973
R. R. Woodruff and James F. Smith Nov. 1974 24 p refs
(AF Proj. 1123)
(AD-A008197; AFHRL-TR-74-78) Avail: NTIS CSCL 05/9

Twenty-one Ss, selected from three Undergraduate Pilot Training classes, were given contact flight training in a T-4G/EPT simulator before going to T-37 aircraft for further training. Fourteen of these Ss were also given instrument training in the T-4G/EPT before completing such training in the aircraft. The remaining seven Ss received instrument training in the UPT T-4 instrument and procedures trainer. A specially designed syllabus was used which incorporated batch training, proficiency advancement, and other revised instructional strategies. Check pilot scores for each of the instructional phases were used in comparing performances of the experimental Ss with those of the conventionally trained students. Results indicate devices having the capabilities of the T-4G could be used to achieve an average saving per student of three aircraft hours in contact flight training and ten hours in instrument training. Results also indicate a savings of eight aircraft hours could be achieved in instrument training by using the specially devised syllabus of instruction with existing T-4 instrument trainers. GRA

N75-24769# ARO, Inc., Arnold Air Force Station, Tenn.
AN EXAMINATION OF THE SMALL-AMPLITUDE DYNAMIC STABILITY TEST TECHNIQUE Final Report
James C. Uselton, Bob L. Uselton, and K. R. Helmlinger Apr. 1975 33 p refs Prepared in cooperation with AEDC
(AD-A008477; ARO-VKF-TR-74-90; AEDC-TR-74-131) Avail: NTIS CSCL 14/2

An investigation was conducted at the von Karman Gas Dynamics Facility (VKF) of the Arnold Engineering Development Center (AEDC) to evaluate the validity of the small-amplitude oscillation test technique for obtaining pitch-damping data. The effects of model oscillation frequency, oscillation amplitude, and sting length on pitch-damping characteristics were investigated for several configurations. Also, the pitch-damping data obtained by the small-amplitude forced oscillation method were used in a six-degree-of-freedom computer program to predict decay motion from large amplitudes. These computed angular motions are compared in this report with free decay motion measured on a free-oscillation gas bearing balance. GRA

N75-24770# Kentucky Univ., Lexington. Dept. of Metallurgical Engineering and Materials Science.
GAS ADSORPTION BY ACTIVATED AND IMPREGNATED CARBONS Quarterly Report, Oct. 1974 - Jan. 1975
P. J. Reucroft and C. T. Chiou Jan. 1975 9 p refs
(Contract DAAA15-74-C-0163; DA Proj. 1W7-62710-A095)
(AD-A008445; EC-CR-75003; QR-3) Avail: NTIS CSCL 14/2

An assembly has been constructed for measuring equilibrium absorption isotherms on activated and impregnated carbons. The pumping system, pressure-measuring devices and microbalance assembly have been tested. Construction of the fume hood exhaust and filter assembly is under way. GRA

N75-24771# Wyle Labs., Inc., El Segundo, Calif.
AIRPORT NOISE REDUCTION FORECAST. VOLUME 1: SUMMARY REPORT FOR 23 AIRPORTS Final Report, Jul. 1972 - Oct. 1974

Carroll Bartel, Louis C. Sutherland, and Leroy Simpson Oct. 1974 253 p refs Prepared in cooperation with Speas (R. Dixon) Assoc., Manhasset, N.Y.
(Contract DOT-OS-20088)
(PB-239387/4; WRC-74-14-1) Avail: NTIS HC $8.00 HC also available from NTIS $14.00/set of 2 reports as PB-239386-SET CSCL 01E

A detailed analysis of cost effectiveness of two aircraft noise reduction alternatives was carried out and the results are summarized. The alternatives consisted of: two different modifications of civil air carrier aircraft having JT3D or JT8D engines. Both alternatives assumed standard use of a two-segment approach procedure incorporating a glide slope for landing. The analysis specified includes a detailed evaluation of noise impact at 23 airports for the years 1972, 1978, 1981, and 1987 along with a detailed cost analysis of implementing the alternatives.
GRA

N75-24772# Wyle Labs., Inc., El Segundo, Calif.
AIRPORT NOISE REDUCTION FORECAST. VOLUME 2: NEF COMPUTER PROGRAM DESCRIPTION AND USER'S MANUAL Final Report, Jul. 1972 - Oct. 1974
Carroll Bartel, Charles Coughlin, John Moran, and Larry Watkins Oct. 1974 229 p refs
(Contract DOT-OS-20088)
(PB-239388/2; WRC-74-14-2; DOT-TST-75-4) Avail: NTIS HC $7.50 HC also available from NTIS $14.00/set of 2 reports as PB-239386 CSCL 01E

A fundamental requirement of this effort was that the noise impact of air traffic around major airports on the surrounding community should be described and that predictions of various noise abatement alternatives should be made. For this the DOT/Wyle noise exposure forecast computer program was developed. Volume 2 of the report is a description of this program. Included are brief descriptions of the calculations performed, the subroutines that perform them, and a user's guide. Also included is a complete listing of the program, in FORTRAN V. Inputs to the program are a description of the airport geometry including flight paths, aircraft noise and performance characteristics, and the aircraft fleet mix.
GRA

N75-24773# Georgia Inst. of Tech., Atlanta.
ENVIRONMENT AND RADAR OPERATION SIMULATOR Quarterly Report, 1 Oct. - 31 Dec. 1974
S. N. Cole, R. C. Michelson, W. J. Storey, and C. D. Trawick Mar. 1975 26 p refs
(Contract DAAB07-74-C-0272)
(AD-A008051; ECOM-74-0272-2; QR-2) Avail: NTIS CSCL 17/9

The report summarizes activities directed toward the design and fabrication of an Environment and Radar Operation Simulator (EROS). The literature survey tasks concerning signal characteristics and synthesis techniques have been pursued, and a description of their findings is provided. The computerized bibliography records system developed to support these activities is also described. The study of complex envelopes was treated in the first quarterly report pertaining to the properties of the continuous signals used as inputs to the RF complex modulator. During the second quarter, the complex envelope study task has been directed primarily toward the digital signal synthesis problem. Therefore, this report reviews some of the discrete signal analysis facilities, the z-transform and discrete autocorrelation function, and discusses their relevance to the EROS signal synthesis problem.
GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N75-24774* National Aeronautics and Space Administration. Pasadena Office, Calif.
MATERIAL SUSPENSION WITHIN AN ACOUSTICALLY EXCITED RESONANT CHAMBER Patent
Taylor G. Wang (JPL), Melvin M. Saffren (JPL), and Daniel D. Elleman, inventors (to NASA) (JPL) Issued 13 May 1975 10 p Filed 31 Aug. 1973 Supersedes N73-31443 (11 - 22, p 2677) Sponsored by NASA
(NASA-Case-NPO-13263-1; US-Patent-3,882,732; US-Patent-Appl-SN-393523; US-Patent-Class-73-505) Avail: US Patent Office CSCL 22A

A method is described for positioning an object within a chamber, which is especially useful in performing manufacturing operations under zero gravity conditions. Sound waves are applied within the chamber in different directions and at a frequency for each direction that establishes a standing wave pattern so that the object is automatically urged towards the intersections of the nodes, or locations of minimum pressure.
Official Gazette of the U.S. Patent Office

N75-24775*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
AUTOMATED SPACE PROCESSING PAYLOADS STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report
Jan. 1975 32 p
(Contract NAS8-30741)
(NASA-CR-120772; BSR-4171-Vol-1) Avail: NTIS HC $3.75 CSCL 22A

An investigation is described which examined the extent to which the experiment hardware and operational requirements can be met by automatic control and material handling devices; payload and system concepts are defined which make extensive use of automation technology. Topics covered include experiment requirements and hardware data, capabilities and characteristics of industrial automation equipment and controls, payload grouping, automated payload conceptual design, space processing payload preliminary design, automated space processing payloads for early shuttle missions, and cost and scheduling. M.J.S.

N75-24776*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
AUTOMATED SPACE PROCESSING PAYLOADS STUDY. VOLUME 2, BOOK 1: TECHNICAL REPORT Final Report
Jan. 1975 227 p refs
(Contract NAS8-30741)
(NASA-CR-120773; BSR-4171-Vol-2-Bk-1) Avail: NTIS HC $5.75 CSCL 14B

The extent was investigated to which experiment hardware and operational requirements can be met by automatic control and material handling devices; payload and system concepts that make extensive use of automation technology are defined. Hardware requirements for each experiment were established and tabulated, and investigations of applicable existing hardware were documented. The capabilities and characteristics of industrial automation equipment, controls, and techniques are presented in the form of a summary of applicable equipment characteristics in three basic mutually-supporting formats. Facilities for performing groups of experiments are defined along with four levitation groups and three furnace groups; major hardware elements required to implement them were identified. A conceptual design definition of ten different automated processing facilities is presented along with the specific equipment to implement each facility and the design layouts of the different units. Constraints and packaging, weight, and power requirements for six payloads postulated for shuttle missions in the 1979 to 1982 time period were examined. M.J.S.

N75-24777*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
AUTOMATED SPACE PROCESSING PAYLOADS STUDY. VOLUME 2, BOOK 2: TECHNICAL REPORT, APPENDICES A THROUGH E Final Report
Jan. 1975 123 p
(Contract NAS8-30741)
(NASA-CR-120774; BSR-4171-Vol-2-Bk-2) Avail: NTIS HC $5.25 CSCL 22A

Experiment hardware and operational requirements for space shuttle experiments are discussed along with payload and system concepts. Appendixes are included in which experiment data sheets, chamber environmental control and monitoring, method for collection and storage of electrophoretically-separated samples, preliminary thermal evaluation of electromagnetic levitation facilities L1, L2, and L3, and applicable industrial automation equipment are discussed. M.J.S.

N75-24778*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
AUTOMATED SPACE PROCESSING PAYLOADS STUDY. VOLUME 3: EQUIPMENT DEVELOPMENT RESOURCE REQUIREMENTS Final Report
Jan. 1975 30 p
(Contract NAS8-30741)
(NASA-CR-120775; BSR-4171-Vol-3) Avail: NTIS HC $3.75 CSCL 14B

Facilities are described on which detailed preliminary design was undertaken and which may be used on early space shuttle missions in the 1979-1982 time-frame. The major hardware components making up each facility are identified, and development schedules for the major hardware items and the payload buildup are included. Cost data for the facilities, and the assumptions and ground rules supporting these data are given along with a recommended listing of supporting research and technology needed to ensure confidence in the ability to achieve successful development of the equipment and technology.
M.J.S.

N75-24779*# Kanner (Leo) Associates, Redwood City, Calif.
COSMONAUTICS AND ECONOMICS
N. Fotkin Washington NASA Jun. 1975 10 p Transl. into ENGLISH from Aviatsiya i Kosmonavtika (Moscow), no. 5, May 1975 p 42-43
(Contract NASw-2481)
(NASA-TT-F-16404) Avail: NTIS HC $3.25 CSCL 22A

Several states of growth of cosmonautics are outlined briefly. The development of jet engines and rockets, the first successful spacecraft launches, the exploratory stage of avalanche-like growth in space activity, the contribution to the national economy and to science and the modern stage of increasing the economic return and decreasing the cost are included. The main emphasis is on the contributions of cosmonautics to the national economy, through communications, meteorological, earth resources study, and other satellite systems. The need to develop reusable and long-term space vehicles, including the specific contributions of the Salyut series, is discussed. Author

N75-24780*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
REPAIR OF MAJOR SYSTEM ELEMENTS ON SKYLAB
Robert E. Pace, Jr. Oct. 1974 34 p refs
(NASA-TM-X-64928) Avail: NTIS HC $3.75 CSCL 22A

In-flight maintenance, as conceived and preplanned for the Skylab mission was limited to simple scheduled and unscheduled replacement tasks and minor contingency repairs. Tools and spares were provided accordingly. However, failures during the mission dictated complicated and sophisticated repairs to major systems so that the mission could continue. These repairs included the release of a large structure that failed to deploy, the assembly and deployment of large mechanical devices, the installation and checkout of precision electronic equipment, troubleshooting and repair of precision electromechanical equipment, and tapping into and recharging a cooling system. The repairs were conducted both inside the spacecraft and during extravehicular activities. Some of the repair tasks required team effort on the part of the crewmen including close procedural coordination between internal and extravehicular crewmen. The Skylab experience indicates that crewmen can, with adequate training, make major system repairs in space using standard or special tools. Design of future spacecraft systems should acknowledge this capability and provide for more extensive in-flight repair and maintenance.
Author

N75-24781# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
SUPPORTING STUDY FOR THE DEFINITION OF EXPERIMENTAL OBJECTIVES OF THE FIRST SPACELAB MISSION ESRO Spacelab Utilization Program. Final Presentation Briefing Brochure
16 Dec. 1974 101 p 3 Vol.
(Contract ESRO-SC/47/74-HQ)
(ESRO-CR(P)-636) Avail: NTIS HC $5.25

The experimental objectives of the first Spacelab mission are summarized. Mission objectives and constraints are listed and experimental objectives in the fields of astronomy and extraterrestrial science, atmosphere physics, earth observation, communication and navigation, life science, and material science are tabulated. The results of a grouping analysis and of the payload accommodation evaluation are presented. Finally, programmatics and costs details are given. ESRO

N75-24782# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
SUPPORTING STUDY FOR THE DEFINITION OF EXPERIMENTAL OBJECTIVES OF THE FIRST SPACELAB MISSION. VOLUME 1: EXPERIMENTAL OBJECTIVES ESRO Spacelab Utilization Program. Final Report
Dec. 1974 283 p refs 3 Vol.
(Contract ESRO-SC/47/74-HQ)
(MBB-FSP-74-01-Vol-1; ESRO-CR(P)-637-Vol-1) Avail: NTIS HC $8.75

The replies from the European user community on ESRO's call for proposals for scientific missions of the first Spacelab flight were analyzed and evaluated. The first mission objectives and its constraints are discussed, and the European proposals which were grouped into the fields of astronomy, astrophysics, atmosphere physics, earth observation, life science, and material science, are presented. The selection of grouping candidates and the identification of experimental objectives are considered. The total payload consideration is given, and the requirement analysis is discussed. ESRO

N75-24783# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
SUPPORTING STUDY FOR THE DEFINITION OF EXPERIMENTAL OBJECTIVES OF THE FIRST SPACELAB MISSION. VOLUME 3: EXPERIMENT DATA SHEETS ESRO Spacelab Utilization Program. Final Report
Dec. 1974 228 p 3 Vol.
(Contract ESRO-SC/47/74-HQ)
(MBB-FPS-74-04-Vol-3; ESRO-CR(P)-638-Vol-3) Avail: NTIS HC $7.50

The proposals for the first Spacelab mission, prepared by the European user community, were screened against mission objectives and Spacelab constraints. For the remaining proposals representative experiments were defined. The characteristic data for these experiments are assembled. Histograms for the parameters weight, pressurized volume, average power, total energy, experiment duration per cycle, and personnel time per cycle are also given. ESRO

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N75-24784 Oklahoma State Univ., Stillwater.
STATE ESTIMATION OF REENTRY VEHICLES FROM OPTICAL TRACKING DATA Ph.D. Thesis
Vinod Kumar Bhandi 1974 134 p
Avail: Univ. Microfilms Order No. 75-8715

A computer software package for generating filtered and smoothed estimates of the state of a reentry vehicle using optical tracking data is developed. Dynamic and observation models, a second-order filter algorithm with plant noise, a fixed-interval smoother algorithm for nonlinear systems, and an adaptive plant noise algorithm for solving divergence problems were derived. The operation of the software package is verified by generating estimates using three different data sets. The first case is based on a simulated trajectory of a reentry vehicle with a constant ballistic coefficient, the second case is based on a simulated trajectory of a vehicle whose ballistic coefficient is a parabolic function of altitude, and the third case is based on actual data with an unknown true trajectory. A Monte-Carlo study is conducted to determine the confidence in package performance when processing other data sets. Results are presented.
Dissert. Abstr.

N75-24785*# Ball Bros. Research Corp., Boulder, Colo. Rocket and Balloon Pointing Systems.
DETERMINATION OF THE CENTER OF BRIGHTNESS OF

THE LUNAR CRESCENT Final Report
Charlie Rose 20 Jan. 1975 98 p
(Contract NAS5-23185)
(NASA-CR-143809; F74-13) Avail: NTIS HC $4.75 CSCL 22A

The operational characteristics of the lunar sensor which was used to point the sounding rocket are discussed briefly. The associated mathematical model of the system is developed and the computer programs which were written to implement the model are described. Data pertinent to the two launches is presented. Author

N75-24786*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
APPROACH GUIDANCE FOR OUTER PLANET PIONEER MISSIONS
Antal K. Bejczy 1 May 1975 24 p refs
(Contract NAS7-100)
(NASA-CR-142935; TM-33-726) Avail: NTIS HC $3.25 CSCL 22A

Onboard optical approach guidance measurements for spin-stabilized Pioneer-type spacecraft are discussed. Approach guidance measurement accuracy requirements are outlined. The application concept and operation principle of the V-slit star tracker are discussed within the context of approach guidance measurements and measurables. It is shown that the accuracy of onboard optical approach guidance measurements is inherently coupled to the stability characteristics of the spacecraft spin axis. Geometrical and physical measurement parameters are presented for Pioneer entry probe missions to Uranus via Jupiter or Saturn flyby. The impact of these parameters on both sensor instrumentation and measurement system design is discussed. The need for sensing extended objects is shown. The feasibility of implementing an onboard approach guidance measurement system for Pioneer-type spacecraft is indicated. Two Pioneer 10 onboard measurement experiments performed in May-June 1974 are described. Author

N75-24787*# National Aeronautics and Space Administration, Washington, D.C.
[DAWN OF THE SPACE AGE AND PREPARATION FOR APOLLO-SOYUZ RENDEZVOUS]
George E. Low 5 Jun. 1975 6 p
(NASA-TM-X-66862) Avail: NTIS HC $3.25 CSCL 22A

The technological achievements of the space age are touched upon in terms of the Apollo-Soyuz Test Project. It is indicated that the most important aspect of Apollo-Soyuz is international cooperation in the field of space. J.M.S.

N75-24788*# International Business Machines Corp., Huntsville, Ala. Space Systems.
IUS/TUG ORBITAL OPERATIONS AND MISSION SUPPORT STUDY, VOLUME 1 Final Report
May 1975 69 p refs 5 Vol.
(Contract NAS8-31009)
(NASA-CR-143853; IBM-75W-00072-Vol-1) Avail: NTIS HC $4.25 CSCL 22A

The space transportation system (STS) is discussed which will include a propulsive stage that is carried into low earth orbit by the space shuttle. Data were accumulated from the analyses of various stage concepts, operating modes, and projected missions (space tug systems studies, growth stage studies, engine studies, and critical area studies). The foundation formulated by these studies aided in establishing a tentative two-phase approach for the extension of the STS operating regime beyond the space shuttle including plane changes, higher orbits, geosynchronous orbits and beyond. The orbital operations study, was conducted to provide the generation and analysis of operational plans, requirement, and concepts for the utilization of these vehicles. Primary emphasis was placed on methods and techniques to provide a sound technical approach to operations at reduced cost for the STS mission period. Author

N75-24789*# International Business Machines Corp., Huntsville, Ala. Space Systems.
IUS/TUG ORBITAL OPERATIONS AND MISSION SUPPORT STUDY. VOLUME 2: INTERIM UPPER STAGE OPERATIONS Final Report
May 1975 233 p refs 5 Vol.
(Contract NAS8-31009)
(NASA-CR-143854; IBM-75W-00072-Vol-2) Avail: NTIS HC $7.50 CSCL 22A

Background data and study results are presented for the interim upper stage (IUS) operations phase of the IUS/tug orbital operations study. The study was conducted to develop IUS operational concepts and an IUS baseline operations plan, and to provide cost estimates for IUS operations. The approach used was to compile and evaluate baseline concepts, definitions, and system, and to use that data as a basis for the IUS operations phase definition, analysis, and costing analysis. Both expendable and reusable IUS configurations were analyzed and two autonomy levels were specified for each configuration. Topics discussed include on-orbit operations and interfaces with the orbiter, the tracking and data relay satellites and ground station support capability analysis, and flight control center sizing to support the IUS operations. M.J.S.

N75-24790*# International Business Machines Corp., Huntsville, Ala. Space Systems.
IUS/TUG ORBITAL OPERATIONS AND MISSION SUPPORT STUDY. VOLUME 3: SPACE TUG OPERATIONS Final Report
May 1975 534 p refs 5 Vol.
(Contract NAS8-31009)
(NASA-CR-143855; IBM-75W-00072-Vol-3) Avail: NTIS HC $12.50 CSCL 22A

A study was conducted to develop space tug operational concepts and baseline operations plan, and to provide cost estimates for space tug operations. Background data and study results are presented along with a transition phase analysis (the transition from interim upper state to tug operations). A summary is given of the tug operational and interface requirements with emphasis on the on-orbit checkout requirements, external interface operational requirements, safety requirements, and system operational interface requirements. Other topics discussed include reference missions baselined for the tug and details for the mission functional flows and timelines derived for the tug mission, tug subsystems, tug on-orbit operations prior to the tug first burn, spacecraft deployment and retrieval by the tug, operations centers, mission planning, potential problem areas, and cost data. M.J.S.

N75-24791*# International Business Machines Corp., Huntsville, Ala. Space Systems.
IUS/TUG ORBITAL OPERATIONS AND MISSION SUPPORT STUDY. VOLUME 4: PROJECT PLANNING DATA Final Report
May 1975 39 p 5 Vol.
(Contract NAS8-31009)
(NASA-CR-143856; IBM-75W-00072-Vol-4) Avail: NTIS HC $3.75 CSCL 22A

Planning data are presented for the development phases of interim upper stage (IUS) and tug systems. Major project planning requirements, major event schedules, milestones, system development and operations process networks, and relevant support research and technology requirements are included. Topics discussed include: IUS flight software; tug flight software; IUS/tug ground control center facilities, personnel, data systems, software, and equipment; IUS mission events; tug mission events; tug/spacecraft rendezvous and docking; tug/orbiter operations interface, and IUS/orbiter operations interface. M.J.S.

N75-24792*# International Business Machines Corp., Huntsville, Ala. Space Systems.
IUS/TUG ORBITAL OPERATIONS AND MISSION SUPPORT STUDY. VOLUME 5: COST ESTIMATES Final Report
May 1975 184 p refs 5 Vol.
(Contract NAS8-31009)
(NASA-CR-143857; IBM-75W-00072-Vol-5) Avail: NTIS HC $7.00 CSCL 22A

The costing approach, methodology, and rationale utilized for generating cost data for composite IUS and space tug orbital operations are discussed. Summary cost estimates are given along with cost data initially derived for the IUS program and space tug program individually, and cost estimates for each work breakdown structure element. M.J.S.

N75-24793# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).
LAGRANGE PERTURBATION EQUATIONS FOR NONINERTIAL REFERENCE SYSTEMS [LAGRANGESCHE STOERUNGSGLEICHUNGEN BEZUEGLICH NICHTINERTIALER BEZUGSSYSTEME]
Christoph Reigber Bayerische Akad. der Wiss. 1974 35 p refs In GERMAN Sponsored by Deut. Forschungsgemeinschaft
(Ser-A-79; TUM-Mitt-110; ISBN-3-7696-8164-9) Avail: NTIS HC $3.75

In order to calculate satellite orbital element perturbations in a noninertial reference system, the usual form of the Lagrangian perturbation equations for inertial reference systems are expressed in the noninertial systems and the element perturbations are calculated directly in the corotating systems on the resulting relationships. ESRO

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N75-24794* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEVICE FOR USE IN LOADING TENSION MEMBERS Patent
Walter T. Appleberry, inventor (to NASA) (McDonnell-Douglas Corp., Huntington Beach, Calif.) Issued 13 May 1975 5 p Filed 10 May 1973 Supersedes N73-23526 (11 - 14, p 1667) Sponsored by NASA
(NASA-Case-MFS-21488-1; US-Patent-3,882,719;
US-Patent-Appl-SN-359156; US-Patent-Class-73-143) Avail: US Patent Office CSCL 14B

The indicator is characterized by an elongated elastic body having extended from the opposite ends of threaded shanks adapted to selected tension members. A pair of external shoulders, one of which is axially displaceable relative to the other, and a rigid tubular sleeve interposed between said shoulders are included. Tension is applied to the elastic body for imparting strain. The movable shoulder can be advanced into abutting engagement with the sleeve, whereby the sleeve is placed in compression once the tensile forces are removed from the shanks. A reapplication of tensile forces equal to the initially applied tensile forces removes the sleeve from compression, whereby the sleeve is freed for rotation for thus indicating the magnitude of the applied tensile forces.
Official Gazette of the U.S. Patent Office

N75-24795# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE PROBLEM OF OAK BODIES IN COMPARING MEASUREMENTS IN VARIOUS SPACE SIMULATION CHAMBERS
W. Hallmann, K. Kramp, and H. P. Schmidt 18 Feb. 1975 46 p refs Transl. into ENGLISH of the book issued by Deut. Forsch.- und Versuchsanstalt fuer Luft- Raumfahrt Inst. fuer Raumsimulation (Porz-Wahm), Sep. 1974 p 1-36
(AD-A008096; FTD-HC-23-0879-75) Avail: NTIS CSCL 14/2

Experiments made to find a quantitative procedure for determining thermal leaks of test bodies in space simulation chambers are reported. Leaks were determined as a function of energy dissipation in the test body and energy exchange with its surroundings. Due to the number and kind of experiments performed upon a satellite, as well as parameters of the orbit, influences are exercised upon the thermal range; these must be either increased or decreased so that the temperature of the body stays within a defined range. Total thermal behavior is described in a mathematical model of the test body, a system of differential equations, which defines the energy exchange of every network with all other networks and the environment. Author

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N75-24796*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
SKYLAB RESCUE SPACE VEHICLE COUNTDOWN
S. J. Jevitt 22 Aug. 1973 199 p
(NASA-TM-X-66823; KSC-K-1B-0513) Avail: NTIS HC $7.00 CSCL 22D

Operational requirements and launch preparations for the Skylab rescue vehicle are evaluated. The complete countdown procedure is given. Author

N75-24797*# Kanner (Leo) Associates, Redwood City, Calif.
LAUNCH VEHICLES FOR SPACECRAFT
K. V. Morozov Washington NASA Jun. 1975 120 p refs Transl. into ENGLISH from the book "Rakety-Nositeli Kosmicheskikh Apparatov" Moscow, Mashinostroyeniye Press, 1975 p 1-118
(Contract NASw-2481)
(NASA-TT-F-16295) Avail: NTIS HC $5.25 CSCL 22B

Various types of launch vehicles for delivering spacecraft into space are described. Descriptions include general structural details of launch vehicles of several countries as well as their respective engine installations. Perspectives for future launch vehicles in general, and multiple-use ones in particular, are presented. Author

N75-24798# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES, DECEMBER 1974
R. D. Eberst 20 Jan. 1975 33 p
(ROE-STS-197) Avail: NTIS HC $3.75

Stopwatch observations made at stations connected with the Section during December 1974 are listed in satellite launch and time order. A total of 596 fully reduced observations of 152 satellites is presented. Author (ESRO)

N75-24799# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES, JANUARY 1975
R. D. Eberst 12 Feb. 1975 29 p
(ROE-STS-198) Avail: NTIS HC $3.75

Stopwatch observations made at stations connected with the section during January 1975 are listed in satellite launch and time order: 522 fully reduced observations of 130 satellites. Author (ESRO)

N75-24800# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ELECTRICAL PROPULSION SYSTEMS SYNTHESIS OF FUNCTIONAL AND OPERATIONAL CHARACTERISTICS STABILIZATION OF GEOSYNCHRONOUS SATELLITES Ph.D. Thesis - Toulouse Univ., France
N. Chirouze 20 Mar. 1975 150 p refs Transl. into ENGLISH from French report
(AD-A007939; FTD-HC-23-0631-75) Avail: NTIS CSCL 21/3

Orbit and attitude perturbations which affect a satellite are investigated along with the mass balance of various types of electric propulsion. Corrections to north-south and east-west orbits are indicated in order to apply electric propulsion to geosynchronous satellite missions. J.M.S.

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N75-24801*# Boeing Aerospace Co., Seattle, Wash. Research and Engineering Div.
FUTURE SPACE TRANSPORTATION SYSTEMS ANALYSIS STUDY. PHASE 1: TECHNICAL REPORT, APPENDICES
9 May 1975 91 p
(Contract NAS9-14323)
(NASA-CR-141857; D180-18768-3) Avail: NTIS HC $4.75 CSCL 22A

The transportation mass requirements developed for each mission and transportation mode were based on vehicle systems sized to fit the exact needs of each mission (i.e. rubber vehicles). The parametric data used to derive the mass requirements for each mission and transportation mode are presented to enable accommodation of possible changes in mode options or payload definitions. The vehicle sizing and functional requirements used to derive the parametric data will form the basis for conceptual configurations of the transportation elements in a later phase of study. An investigation of the weight growth approach to future space transportation systems analysis is presented. Parameters which affect weight growth, past weight histories, and the current state of future space-mission design are discussed. Weight growth factors of from 10 percent to 41 percent were derived for various missions or vehicles. M.J.S.

N75-24802*# Boeing Aerospace Co., Seattle, Wash.
FUTURE SPACE TRANSPORTATION SYSTEMS SYSTEMS ANALYSIS STUDY, PHASE 1 TECHNICAL REPORT
May 1975 363 p
(Contract NAS9-14323)
(NASA-CR-141856; D180-18768-1) Avail: NTIS HC $10.00 CSCL 22A

The requirements of projected space programs (1985-1995) for transportation vehicles more advanced than the space shuttle are discussed. Several future program options are described and their transportation needs are analyzed. Alternative systems approaches to meeting these needs are presented. D.M.L.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N75-24803# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DABS UPLINK ENCODER
J. R. Samson 4 Mar. 1975 47 p refs
(Contracts DOT-FA72WAI-261; F19628-73-C-002)
(AD-A007621; FAA-RD-74-162; ATC-40) Avail: NTIS HC $3.75 CSCL 09F

The operation of the DABS uplink encoder is described and information useful in diagnosing its performance is given. Several techniques which may be useful in analyzing encoder operation are presented. One technique involves only the use of address-parity tables and modulo-2 addition. The address-parity tables included are based upon a specific encoding polynomial. Author

N75-24804# Dornier-System G.m.b.H., Friedrichshafen (West Germany).
AUTOMATIC CHECKING OF DATA AND STATION PERFORMANCE Final Report
K. Etschberger, comp., E. Velten, and W. Koehler Aug. 1974 88 p
(Contract ESOC-568/73-AR)
(ESRO-CR(P)-616) Avail: NTIS HC $4.75

Possibilities for improved monitoring and control of a future central European ground station (REDU-type station) were investigated. The objectives and function of a station monitoring and control system (SMCS) are presented and the design of such a system is discussed. Data parameters to be monitored and controlled by an SMCS were established and system implementation costs were estimated. ESRO

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N75-24805*# Aerospace Corp., El Segundo, Calif.
ACTIVE SUPPRESSION OF POGO ON THE SPACE SHUTTLE
M. H. Lock and S. Rubin 25 Oct. 1974 117 p refs
(Contract NAS3-17758)
(NASA-CR-134749; ATR-75(7428)-1) Avail: NTIS HC $5.25 CSCL 22B

The use of active pogo suppressors on the space shuttle was qualitatively investigated. Suppressor design concepts and the effectiveness of these designs in maintaining the stability of the shuttle vehicle were the primary concerns. Suppressor design concepts were developed by means of a series of parametric stability analyses. These two designs together with two designs provided by NASA were evaluated in detail for control effectiveness, performance relative to a passive suppression device, sensitivity of performance to feedback error, suppressor volume flow requirements, and suppressor development requirements. An active device at the high pressure oxidizer pump inlet was shown to provide a simple and effective design that is insensitive to error in the feedback signal. The sizing of an active suppressor was demonstrated to be dependent upon knowledge of the dynamic characteristics of the system. Author

N75-24806*# Martin Marietta Corp., Denver, Colo.
DESIGN CRITERIA FOR PAYLOAD WORKSTATION ACCOMMODATIONS Final Report
Harry H. Watters and Jack W. Stokes May 1975 67 p
(Contract NAS8-30952)
(NASA-CR-120777; MCR-75-195) Avail: NTIS HC $4.25 CSCL 22A

Anticipated shuttle sortie payload man-system design criteria needs are investigated. Man-system interactions for the scientific disciplines are listed and the extent is assessed to which documented Skylab experience is expected to provide system design guidance for each of the identified interactions. Where the analysis revealed that the reduced Skylab data does not answer the anticipated needs candidate criteria, based on unreduced Skylab data, available prior research, original analysis, or related requirements derived from previous space programs, are provided. Author

N75-24807*# Rockwell International Corp., Downey, Calif. Space Div.
ANALYSIS OF COMMERCIAL EQUIPMENT AND INSTRUMENTATION FOR SHUTTLE SORTIE LAB PAYLOADS. VOLUME 1: EXECUTIVE SUMMARY
16 Sep. 1974 29 p 3 Vol.
(Contract NAS8-30541)
(NASA-CR-120778; SD-74-SA-0047-1; DR-MA-04-Vol-1) Avail: NTIS HC $3.75 CSCL 22B

A study is summarized which was to assess the feasibility of using commercially available equipment in the spacelab and to investigate methods for reducing the extent of required modifications to this equipment. Specific objectives include compilation of a list of representative equipment and instrumentation, selection of a limited number of these items for analysis, collection of engineering specifications and data relative to these items, analysis of this data with respect to its applicability in the spacelab, determination of the impact of aerospace-type specifications on equipment costs, identification of the cost-effective modifier of commercial equipment, and identification of specific equipment items for test. Significant results are presented. Author

N75-24808*# Rockwell International Corp., Downey, Calif. Space Div.
ANALYSIS OF COMMERCIAL EQUIPMENT AND INSTRU-

MENTATION FOR SPACELAB PAYLOADS, VOLUME 2
16 Sep. 1974 383 p 3 Vol.
(Contract NAS8-30541)
(NASA-CR-120779; SD-74-SA-0047-2; DR-MA-04-Vol-2)
Avail: NTIS HC $10.25 CSCL 22B

Technical results are presented of a study to investigate analytically the feasibility of using commercially available laboratory equipment and instrumentation in the spacelab in support of various experiments. The feasibility is demonstrated by the breadth of application of commercial, airborne, and military equipment to experiment equipment requirements in the spacelab, and the cost effectiveness of utilizing this class of equipment instead of custom-built aerospace equipment typical of past designs. Equipment design and specifications are discussed. M.J.S.

N75-24809*# Rockwell International Corp., Downey, Calif. Space Div.
ANALYSIS OF COMMERCIAL EQUIPMENT AND INSTRUMENTATION FOR SPACELAB PAYLOADS. VOLUME 3: DESIGN ANALYSIS AND TRADE STUDIES
16 Sep. 1974 497 p 3 Vol.
(Contract NAS8-30541)
(NASA-CR-120780; SD-74-SA-0047-3; DR-MA-04-Vol-3)
Avail: NTIS HC $12.00 CSCL 22B

A detailed analysis is presented of each selected equipment item, and suitability and cost analyses were documented by equipment item. Tradeoffs of alternative specification requirements are presented which include possible relaxation of vibration, material control, fungus and corrosion requirements for experiment equipment. An additional tradeoff was performed to determine whether it is cost effective to modify experiment equipment to be compatible with a 28-volt dc power source rather than the conventional 110-volt ac source. Programmatic analysis data are given which were used as the basis for the extension of results from the analyses of specific equipment items to the entire spacelab experiment program. M.J.S.

N75-24810*# Scientific Translation Service, Santa Barbara, Calif.
MANUAL CONTROL OF A SPACECRAFT
Ye. Khrunov, V. Trofimov, and V. Gorbunov Washington NASA Jun. 1975 16 p Transl. into ENGLISH from Aviat. Kosmonavt. (USSR), no. 2, Feb. 1975 p 42-44
(Contract NASw-2483)
(NASA-TT-F-16407) Avail: NTIS HC $3.25 CSCL 22A

The essential features of manually controlling spacecraft are discussed, followed by an examination of the methods of orientation. Author

N75-24811*# Scientific Translation Service, Santa Barbara, Calif.
ORBITS OF THE FUTURE
B. N. Petrov Washington NASA 13 Jun. 1975 9 p Transl. into ENGLISH from Trud (USSR), 5 Feb. 1975 p 3
(Contract NASw-2483)
(NASA-TT-F-16330) Avail: NTIS HC $3.25 CSCL 22B

The design of future space stations is discussed. The addition of units carried into space aboard a transport shuttle and joined by a space tug is considered. Electric and magnetic measurements are facilitated by an accompanying satellite. The effects of weightlessness and the possibility of artificial gravity are included. Author

N75-24812*# Chrysler Corp., New Orleans, La. Data Management Services.
RESULTS OF INVESTIGATIONS ON A 0.004-SCALE 140C MODIFIED CONFIGURATION SPACE SHUTTLE VEHICLE ORBITER MODEL (74-0) IN THE NASA/LANGLEY RESEARCH CENTER HYPERSONIC HELIUM TUNNEL
P. J. Hawthorne (Rockwell Intern. Corp., Downey, Calif.) May 1975 110 p
(Contract NAS9-13247)
(NASA-CR-141532; DMS-DR-2205) Avail: NTIS HC $5.25 CSCL 22A

Data obtained during a wind tunnel test of a 0.004-scale 140C modified configuration SSV orbiter are documented. The test was conducted during August 1974 with 80 occupancy hours charged, and all runs were conducted at a nominal Mach number of 20 and at Reynolds numbers of 0.7, 1.0, 1.8, and 1,100,000 based on body length. The complete -140C modified model was tested with various elevon settings at angles of attack from 10 to 50 degrees at zero yaw and from angles of sideslip of -10 to +10 at 35 deg angle of attack. The purpose of this test was to obtain high hypersonic longitudinal and lateral-directional stability and control characteristics of the updated SSV configuration. Author

N75-24813*# Chrysler Corp., New Orleans, La. Data Management Services.
RESULTS OF TESTS ON A ROCKWELL INTERNATIONAL SPACE SHUTTLE ORBITER (-139 CONFIGURATION) 0.0175-SCALE MODEL (NO. 29-0) IN AEDC TUNNEL B TO DETERMINE BOUNDARY LAYER CHARACTERISTICS
M. Quan (Rockwell Intern. Corp., Downey, Calif.) May 1975 213 p refs
(Contract NAS9-13247)
(NASA-CR-141540; DMS-DR-2251) Avail: NTIS HC $7.25 CSCL 22A

Results of wind tunnel tests were conducted to determine boundary layer characteristics on the lower surface of a space shuttle orbiter. Total pressure and temperature profile data at various model stations were obtained using a movable, four-degree-of-freedom probe mechanism and static pressure taps on the model surface. During a typical run, the probe was located over a preselected model location, then driven down through the bondary layer until contact was made with the model surface. Author

N75-24814*# Chrysler Corp., New Orleans, La. Space Div.
HYPERSONIC AEROHEATING TEST OF SPACE SHUTTLE VEHICLE CONFIGURATION 3 (MODEL 22-OTS) IN THE NASA-AMES 3.5-FOOT HYPERSONIC WIND TUNNEL (IH20), VOLUME 1
R. B. Kingsland (Rockwell Intern., Downey, Calif.) and W. K. Lockman (NASA. Ames Res. Center) May 1975 791 p refs 2 Vol.
(Contract NAS9-13247)
(NASA-CR-134440; DMS-DR-2148-Vol-1) Avail: NTIS HC $17.25 CSCL 22A

The results of hypersonic wind tunnel testing of an 0.0175 scale version of the vehicle 3 space shuttle configuration are presented. Temperature measurements were made on the launch configuration, orbiter plus tank, orbiter alone, tank alone, and solid rocket booster alone to provide heat transfer data. The test was conducted at free-stream Mach numbers of 5.3 and 7.3 and at free-stream Reynolds numbers of 1.5 million, 3.7 million, 5.0 million, and 7.0 million per foot. The model was tested at angles of attack from -5 deg to 20 deg and side slip angles of -5 deg and 0 deg. Author

N75-24815*# Chrysler Corp., New Orleans, La. Space Div.
HYPERSONIC AEROHEATING TEST OF SPACE SHUTTLE VEHICLE: CONFIGURATION 3 (MODEL 22 OTS) IN THE NASA-AMES 3.5-FOOT HYPERSONIC WIND TUNNEL (IH20), VOLUME 2
R. B. Kingsland (Rockwell Intern., Downey, Calif.) and W. K. Lockman (NASA. Ames Res. Center) May 1975 761 p refs 2 Vol.
(Contract NAS9-13247)
(NASA-CR-134441; DMS-DR-2148-Vol-2) Avail: NTIS HC $17.25 CSCL 22A

The model tested was an 0.0175-scale version of the vehicle 3 space shuttle configuration. Temperature measurements were made on the launch configuration, orbiter plus tank, orbiter alone, tank alone, and solid rocket booster (SRB) alone to provide heat transfer data. The test was conducted at free stream Mach numbers of 5.3 and 7.3 and at free stream Reynolds numbers of 1.5, 3.7, 5.0, and 7.0 million per foot. The model was tested at angles of attack from -5 deg to 20 deg and side slip angles of -5 deg and 0 deg. Author

N75-24816*# Chrysler Corp., New Orleans, La. Data Management Services.
**RESULTS OF INVESTIGATIONS OF AN 0.010-SCALE 140A/B CONFIGURATION (MODEL 72-OTS) OF THE ROCKWELL INTERNATIONAL SPACE SHUTTLE ORBITER IN THE NASA/LANGLEY RESEARCH CENTER UNITARY

PLAN WIND TUNNEL Space Shuttle Aerothermodynamic Data Report
Michael T. Petrozzi (Rockwell Intern. Corp., Downey, Calif.) and Morris D. Milam (Rockwell Intern. Corp., Downey, Calif.) May 1975 455 p
(Contract NAS9-13247)
(NASA-CR-141528; DMS-DR-2206) Avail: NTIS HC $11.50 CSCL 22B

Experimental aerodynamic investigations were conducted in the NASA/Langley unitary plan wind tunnel on a sting mounted 0.010-scale outer mold line model of the 140A/B configuration of the Rockwell International Space Shuttle Vehicle. The primary test objectives were to obtain: (1) six component force and moment data for the mated vehicle at subsonic and transonic conditions, (2) effects of configuration build-up, (3) effects of protuberances, ET/orbiter fairings and attach structures, and (4) elevon deflection effects on wing bending moment. Six component aerodynamic force and moment data and base and balance cavity pressures were recorded over Mach numbers of 1.6, 2.0, 2.5, 2.86, 3.9, and 4.63 at a nominal Reynolds number of 20 to the 6th power per foot. Selected configurations were tested at angles of attack and sideslip from -10 deg to +10 deg. For all configurations involving the orbiter, wing bending, and torsion coefficients were measured on the right wing. Author

N75-24817*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF DYNAMIC STABILITY TESTS CONDUCTED ON A .012 SCALE MODEL MODIFIED 089 B SHUTTLE ORBITER IN THE AEDC-VKF TUNNEL B AT A MACH NUMBER OF 8.0 (LA42)
J. E. Vaughn and J. T. Daviet May 1975 39 p refs
(Contract NAS9-13247)
(NASA-CR-141535; DMS-DR-2132) Avail: NTIS HC $3.75 CSCL 22B

Experimental aerodynamic investigations were conducted on a .012 scale model of a NASA/Langley modified version of the Rockwell 089B Space Shuttle Orbiter. Using the forced oscillation test technique, dynamic stability derivatives were measured in the pitch, yaw and roll planes at a Mach number of 8 over an angle of attack range from -4 deg to 28 deg. Plotted and tabulated results are presented. Author

N75-24818*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF HEAT TRANSFER TESTS OF AN 0.0175-SCALE SPACE SHUTTLE VEHICLE MODEL 22 OTS IN THE NASA-AMES 3.5 FOOT HYPERSONIC WIND TUNNEL (IH3), VOLUME 1
Thomas F. Foster (Rockwell Intern., Downey, Calif.) and William K. Lockman (NASA. Ames Res. Center) Apr. 1975 737 p refs 4 Vol.
(Contract NAS9-13247)
(NASA-CR-141514; DMS-DR-2136-Vol-1) Avail: NTIS HC $17.25 CSCL 22B

Heat transfer data for the 0.0175-scale space shuttle vehicle 3 are presented. Interference heating effects were investigated by a model build-up technique of orbiter alone, tank alone, second, and first stage configurations. The test program was conducted in the NASA-Ames 3.5-foot hypersonic wind tunnel at Mach 5.3 for nominal free stream Reynolds number per foot values of 1.5, and 5.0 million. Author

N75-24819*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF HEAT TRANSFER TESTS OF AN 0.0175-SCALE SPACE SHUTTLE VEHICLE MODEL 22 OTS IN THE NASA-AMES 3.5-FOOT HYPERSONIC WIND TUNNEL (IH3), VOLUME 2
Thomas F. Foster (Rockwell Intern. Corp., Downey, Calif.) and William K. Lockman (NASA. Ames Res. Center) Apr. 1975 506 p refs 4 Vol.
(Contract NAS9-13247)
(NASA-CR-141515; DMS-DR-2136-Vol-2) Avail: NTIS HC $12.25 CSCL 22B

For abstract, see N75-24818.

N75-24820*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF HEAT TRANSFER TESTS OF AN 0.0175-SCALE SPACE SHUTTLE VEHICLE MODEL 22 OTS IN THE NASA-AMES 3.5-FOOT HYPERSONIC WIND TUNNEL (IH3), VOLUME 3
Thomas F. Foster (Rockwell Intern. Corp., Downey, Calif.) and William K. Lockman (NASA. Ames Res. Center) Apr. 1975 918 p refs 4 Vol.
(Contract NAS9-13247)
(NASA-CR-141516; DMS-DR-2136-Vol-3) Avail: NTIS HC $21.25

Heat-transfer data for the 0.0175-scale space shuttle vehicle 3 are presented, and interference heating effects were investigated by a model build-up technique of the orbiter. The test program was conducted at Mach 5.3 for nominal free-stream Reynolds number per foot values of 1,500,000 and 5,000,000. Author

N75-24821*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FLIGHT PERFORMANCE OF SKYLAB ATTITUDE AND POINTING CONTROL SYSTEM
W. B. Chubb, H. F. Kennel, C. C. Rupp, and S. M. Seltzer Washington Jun. 1975 34 p refs
(NASA-TN-D-8003; M-136) Avail: NTIS HC $3.75 CSCL 22B

The Skylab attitude and pointing control system (APCS) requirements are briefly reviewed and the way in which they became altered during the prelaunch phase of development is noted. The actual flight mission (including mission alterations during flight) is described. The serious hardware failures that occurred, beginning during ascent through the atmosphere, also are described. The APCS's ability to overcome these failures and meet mission changes are presented. The large around-the-clock support effort on the ground is discussed. Salient design points and software flexibility that should afford pertinent experience for future spacecraft attitude and pointing control system designs are included. Author

N75-24822*# Howard Univ., Washington, D.C. Dept. of Mechanical Engineering.
SPACECRAFT DETUMBLING USING MOVABLE TELESCOPING APPENDAGES
Peter M. Bainum and R. Sellappan 1975 35 p refs Proposed for presentation at the Intern. Astronautical Federation 26th Congr., Lisbon, 21-27 Sep. 1975
(Grant NGR-09-011-053)
(NASA-CR-142959; Rept-75-113) Avail: NTIS HC $3.75 CSCL 22B

The dynamics of detumbling a randomly spinning spacecraft using externally mounted, movable telescoping appendages were studied both analytically and numerically. Two types of telescoping appendages are considered: where an end mass is mounted at the end of an (assumed) massless boom; and where the appendage is assumed to consist of a uniformly distributed homogeneous mass throughout its length. From an application of Liapunov's second method, boom extension maneuvers were determined to approach either of two desired final states: close to a zero inertial angular velocity state, and a final spin rate about only one of the principal axes. Recovery dynamics are evaluated analytically for the case of symmetrical deployment. Numerical examination of other asymmetrical cases verifies the practicality of using movable appendages to recover a randomly tumbling spacecraft. Author

N75-24823# Genoa Univ. (Italy). Ist. di Meccanica Applicata alle Macchine.
PRELIMINARY STUDY ON FUEL DYNAMICS IN SPINNING SATELLITES Final Report
Rinaldo C. Michelini Dec. 1974 146 p refs
(Contract ESTEC-1577/72-PF)
(PTR-10/R-261; ESRO-CR(P)-618) Avail: NTIS HC $5.75

Attitude stability and disturbances during maneuvering of spinning spacecraft containing fluids were studied. Mechanics of spinning bodies containing fluids and dynamic characteristics for spheroidal and cylindrical containers are discussed. Testing procedures including test fixtures are presented. Experimental investigations on liquid-filled spherical containers and on fully or partially filled cylindrical containers are exemplified and discussed. ESRO

N75-24824# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany). Hauptabteilung Raumfahrt.

COMPARATIVE STUDY OF METHODS FOR MEASURING MAGNETIC MOMENTS
O. G. Feil and P. Hertz Jun. 1974 64 p refs 3 Vol.
(Contracts ESTEC-1640/72-HP; ESTEC-1951/73-HP)
(TRM-TI-1/74; ESRO-CR(P)-641) Avail: NTIS HC $4.25

Relevant papers found in an extensive literature survey performed to determine methods for measuring magnetic moments of spacecraft are listed and their content described. Tests on various models of a spacecraft containing permanent and induced magnetic moments were performed in order to compare two indirect and one direct method for the determination of magnetic moments. The results show good agreement between the methods for permanent moments. For induced and combined permanent + induced moments the direct method, the measurements of which are specially analyzed, appears to yield best results.
Author (ESRO)

N75-24825# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany). Hauptabteilung Raumfahrt.
COMPARATIVE STUDY OF METHODS FOR MEASURING MAGNETIC MOMENTS. APPENDIX E. COST COMPARISON
May 1974 23 p ref 3 Vol.
(Contracts ESTEC-1640/72-HP; ESTEC-1951/72-HP)
(TRM-TI-1/74-App-E; ESRO-CR(P)-642-App-E) Avail: NTIS HC $3.25

The cost of magnetic test facilities for measuring spacecraft magnetic moments either by indirect or direct method are analyzed and compared. Tests costs are included. ESRO

N75-24826# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany). Hauptabteilung Raumfahrt.
COMPARATIVE STUDY OF METHODS FOR MEASURING MAGNETIC MOMENTS. APPENDIX D: TEST DATA
May 1974 33 p 3 Vol.
(Contracts ESTEC-1640/72-HP; ESTEC-1951/72-HP)
(TRM-TI-1/74-App-D; ESRO-CR(P)-643-App-D) Avail: NTIS HC $3.75

Data on indirect and direct measurement of spacecraft magnetic moments are tabulated. Calibration data of torsion balance are presented. ESRO

N75-24827# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
STUDY, DESIGN, DEVELOPMENT AND TEST OF A TEMPERATURE CONTROLLED ELECTRICAL HEATER SYSTEM FOR SPACE APPLICATION. VOLUME 1: STATUS REPORT ON SPACECRAFT HEATER SYSTEMS Final Report
[1975] 76 p 3 Vol.
(Contract ESTEC-1878/73-PP)
(ESRO-CR(P)-451-Vol-1) Avail: NTIS HC $4.75

Various heater systems for spacecraft application are described with regard to function and performance. Advantages and disadvantages are summarized. Examples are given of various onboard heater systems and associated test techniques. A list of suppliers of heater mats and control units is presented.
ESRO

N75-24828# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
STUDY, DESIGN, DEVELOPMENT AND TEST OF A TEMPERATURE CONTROLLED ELECTRICAL HEATER SYSTEM FOR SPACE APPLICATION. VOLUME 2: DESIGN, MANUFACTURE AND TESTING OF AN ELECTRICAL HEATER SYSTEM WITH ELECTRONIC ON-OFF CONTROLLER Final Report
[1975] 108 p refs 3 Vol.
(Contract ESTEC-1878/73-PP)
(ESRO-CR(P)-452-Vol-2) Avail: NTIS HC $5.25

The development and qualification of an electronic on-off controller for spacecraft application is presented. The functional performance and environmental test results are summarized. The on-off thermostatic heater system consists of a component which is to be temperature controlled, a heater, and a constant temperature environment. The temperature cycling induced by this system is analyzed. Methods and diagrams are given for the analytical determination of component temperature extremes occurring during a temperature cycle for evaluation of the cycle time period. ESRO

N75-24829# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
STUDY, DESIGN, DEVELOPMENT AND TEST OF A TEMPERATURE CONTROLLED ELECTRICAL HEATER SYSTEM FOR SPACE APPLICATION. VOLUME 3: SPECIFICATIONS: UNIT DESIGN SPECIFICATION, HEATER FOIL PROCUREMENT SPECIFICATION: TESTING: TEST PROCEDURES, TEST REPORTS Final Report
[1975] 219 p 3 Vol.
(Contract ESTEC-1878/73-PP)
(ESRO-CR(P)-453) Avail: NTIS HC $7.25

Specifications, test procedures, and test reports used and established during the development and qualifications of a heater system with an electronic on-off controller for spacecraft applications are presented. ESRO

N75-24830# European Space Research Organization, Paris (France).
METHODS OF THRUST VECTOR CONTROL
Harald Twardy Mar. 1975 49 p refs Transl. into ENGLISH of "Verfahren zur Schubvektorsteuerung", DFVLR, Lampoldshausen, West Ger. Report DLR-Mitt-74-26, 24 Jun. 1974 Original German report available from DFVLR, Porz, West Ger. 20.30 DM
(ESRO-TT-143; DLR-Mitt-74-26) Avail: NTIS HC $3.75

Methods of thrust vector control as used for directional guidance in tactical missiles and other rockets are surveyed. These methods are divided into three types; deflection of the jet within the nozzle by means of mechanical devices, secondary liquid or gas injection, and moveable nozzles. Methods based on moveable nozzles are of primary interest due to the availability of suitable high temperature and pressure resisting sealing materials. Author (ESRO)

N75-24831# Northeastern Univ., Boston, Mass. Electronics Research Lab.
CONTROL CIRCUITS FOR A ROCKET PAYLOAD NEUTRALIZATION EXPERIMENT AND OTHER TOPICS Interim Report
Raimundas Sukys and Steven Goldberg Oct. 1974 28 p
(Contract F19628-74-C-0042; AF Proj. 6681)
(AD-A008039; AFCRL-TR-74-0580; SR-1) Avail: NTIS CSCL 19/4

A Ute Tomahawk rocket was launched on 16 August 1974 from the White Sands Missile Range in New Mexico to test the feasibility of rocket charge neutralization through the ejection of electrons. Description of the circuits used to control and measure the ejection is presented in the first part of this report. Summary of other work performed during the first twelve months under this contract is given in the second part. This work consisted mostly of modifications and preparation of existing electronic assemblies for mass spectrometers to be flown on rockets.
GRA

N75-24832# Hawker Siddeley Dynamics Ltd., Stevenage (England).
A 1000 Nms AND 150 Nms FLYWHEELS OPTIMISATION STUDY
J. M. Standing Paris ESRO Sep. 1974 405 p refs
(Contract ESTEC-1335/71-SL)
(ESRO-CR-92) Avail: NTIS HC $10.50

The details of the 1000 Nms and 150 Nms flywheel optimization studies are presented in response to ESTEC design specifications. Both flywheels are discussed for possible application in the European communication satellite. Details of calculation and computer programs are also included. For individual titles, see N75-24833 through N75-24834.

N75-24833 Hawker Siddeley Dynamics Ltd., Stevenage (England).
A 1000 Nms FLYWHEEL OPTIMISATION STUDY
In its A 1000 Nms and 150 Nms Flywheels Optimisation Study Sep. 1974 p 1-75 refs (For availability see N75-24832 16-18)

The following design and structural elements are considered for the 1000 Nms flywheel: design constraint and requirements,

optimal configuration; thermal properties; wheel design; case design; minimum equivalent mass designs; lubricant selection and trade-offs; bearing specifications; windage; and vibration.
ESRO

N75-24834 Hawker Siddeley Dynamics Ltd., Stevenage (England).
A 150 Nms FLYWHEEL OPTIMISATION STUDY
In its A 1000 Nms and 150 Nms Flywheels Optimisation Study Sep. 1974 p 77-216 refs (For availability see N75-24832 16-18)

The following design and structural elements are considered for the 150 Nms flywheel: design constraint and requirements; optimal configuration; thermal properties; wheel design; case design; minimum equivalent mass designs; lubricant selection and trade-offs; bearing specification; windage; and vibration. Results of dynamic analysis of five different spoked flywheels are reported. The motor design for the 1000 Nms flywheel is studied, and iron-loss calculations show that the minimum equivalent mass design occurs lower in the wheel's speed range than anticipated. Design recommendations were modified to limit speeds over 5000 rpm. The drive electronics for both the ac hybrid synchronous and dc brushless motors are also compared.
ESRO

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N75-24835# Technisch Physisch Dienst TNO-TH, Delft (Netherlands).
EVALUATION OF SEVEN SPECIAL-ORDER EIGHT SLIT SILICON PHOTODECTORS, MANUFACTURED BY PHOTO-MATRIX LTD.
C. W. deBoom 9 Dec. 1974 46 p refs
(Contract ESTEC-1487/71-HP)
(Rept-411.730; ESRO-CR(P)-615) Avail: NTIS HC $3.75

The results of an evaluation of seven 8-slit detectors are summarized. The following detector properties were investigated: inspection of detector casing and geometry of the pattern of sensitive elements, determination of diode dc characteristics and dynamic resistance at zero bias, measurement of detector capacitance, measurement of relative spectral sensitivity in the 350- to 1200-nm range, absolute calibration of the spectral sensitivity at one wavelength, and light spot measurements for determination of the spatial uniformity of the sensitivity and window quality. Batch uniformity measurements on the detector showed two groups of detectors having different electrical and optical properties, due probably to differences in doping concentration in the bulk material. One device meets the highest performance requirements and was selected as the light detector in the star mapper breadboard model. ESRO

N75-24836# Teledyne Ryan Aeronautical Co., San Diego, Calif.
AUTONOMOUS NAVIGATION TECHNOLOGY ALTIMETER: CONCEPTUAL DESIGN STUDY Final Report, 2 Jan. 1974 - 31 Mar. 1975
Gary A. Murdock and Walter Pagels 31 Mar. 1975 153 p refs
(Contract F04701-74-C-0233)
(AD-A008183; TRA-29169-22; SAMSO-TR-75-42) Avail: NTIS CSCL 22/2

Work was performed during a study program to define the parameters of a low duty cycle orbital space radar altimeter which could be used to update the autonomous navigation of earth satellites without betraying the satellite location. This report also contains the general constraints of space altimetry and a general guideline to the design of space altimeters. GRA

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N75-24837* National Aeronautics and Space Administration. Pasadena Office, Calif.
HEAT OPERATED CRYOGENIC ELECTRICAL GENERATOR Patent
Taylor G. Wang (JPL), Melvin M. Saffren (JPL), and Daniel D. Elleman, inventors (to NASA) (JPL) Issued 1 Apr. 1975 8 p Filed 1 Apr. 1974 Supersedes N74-19701 (12 - 11, p 1250) Sponsored by NASA
(NASA-Case-NPO-13303-1; US-Patent-3,875,435; US-Patent-Appl-SN-457295; US-Patent-Class-310-40; US-Patent-Class-310-52; US-Patent-Class-310-10; US-Patent-Class-310-4; US-Patent-Class-60-530; US-Patent-Class-60-516; US-Patent-Class-62-3; US-Patent-Class-62-467; US-Patent-Class-335-216) Avail: US Patent Office CSCL 10B

An electrical generator useful for providing electrical power in deep space, is disclosed. The electrical generator utilizes the unusual hydrodynamic property exhibited by liquid helium as it is converted to and from a superfluid state to cause opposite directions of rotary motion for a rotor cell thereof. The physical motion of the rotor cell was employed to move a magnetic field provided by a charged superconductive coil mounted on the exterior of the cell. An electrical conductor was placed in surrounding proximity to the cell to interact with the moving magnetic field provided by the superconductive coil and thereby generate electrical energy. A heat control arrangement was provided for the purpose of causing the liquid helium to be partially converted to and from a superfluid state by being cooled and heated, respectively.
Official Gazette of the U.S. Patent Office

N75-24838*# Pratt and Whitney Aircraft, West Palm Beach, Fla. Research and Development Center.
SPACE SHUTTLE MAIN ENGINE DEFINITION (PHASE B). VOLUME 2: AVIONICS Engine Design Definition Report
21 Apr. 1971 216 p
(Contract NAS8-26186)
(NASA-CR-120630; PWA FR-4249-Vol-2) Avail: NTIS HC $7.25 CSCL 21H

The advent of the space shuttle engine with its requirements for high specific impulse, long life, and low cost have dictated a combustion cycle and a closed loop control system to allow the engine components to run close to operating limits. These performance requirements, combined with the necessity for low operational costs, have placed new demands on rocket engine control, system checkout, and diagnosis technology. Based on considerations of precision environment, and compatibility with vehicle interface commands, an electronic control, makes available many functions that logically provide the information required for engine system checkout and diagnosis. Author

N75-24839*# Pratt and Whitney Aircraft, West Palm Beach, Fla. Research and Development Center.
SPACE SHUTTLE MAIN ENGINE DEFINITION (PHASE B). VOLUME 5: VALVES AND INTERCONNECTS Engine Design Definition Report
Don F. Schultz 21 Apr. 1971 126 p
(Contract NAS8-26186)
(NASA-CR-120633; PWA FR-4249-Vol-5) Avail: NTIS HC $5.75 CSCL 21H

The steady state thermodynamic cycle balance of the single preburner staged combustion engine, coupled with dynamic transient analyses, dictated in detail the location and requirements for each valve defined in this volume. Valve configuration selections were influenced by overall engine and vehicle system weight and failure mode determinations. Modulating valve actuators are external to the valve and are line replaceable. Development and satisfactory demonstration of a high pressure dynamic shaft seal has made this configuration practical. Pneumatic motor driven actuators that use engine pumped hydrogen gas as the working fluid are used. The helium control system is proposed as a module containing a cluster of solenoid actuated valves. The separable couplings and flanges are designed to assure minimum leakage with minimum coupling weight. The deflection of the seal surface in the flange is defined by finite element analysis that has been confirmed with test data. The seal design proposed has passed preliminary pressure cycling and thermal cycling tests. Author

N75-24840# Advisory Group for Aerospace Research and Development, Paris (France).
RADIATION COOLING OF THRUST NOZZLES
J. J. Bernard (Paris Univ.) and J. Genot (ONERA) Mar. 1975 81 p refs
(AGARD-AG-184; AGARDograph-184) Avail: NTIS HC $4.75 CSCL 21H

Various heat transfers by radiation occur on the wall of a propulsion system, and the calculation of such heat transfers in axisymmetrical thrust nozzles is presented. The functions for exchanges between isothermal lines on the surface of revolution or plane cross-sections slightly inclined to the parallel lines are also shown. Numerical results are given in the form of universal functions of the geometrical parameters for the meridian. The diagrammatic configurations for the most usual type of nozzles, and the directly usable values of the transfer functions are quoted. Author

N75-24841*# Rockwell International Corp., Seal Beach, Calif. Space Div.
STUDY OF LIQUID OXYGEN/LIQUID HYDROGEN AUXILIARY PROPULSION SYSTEMS FOR THE SPACE TUG Final Report
J. F. Nichols 15 Jun. 1975 267 p refs
(Contract NAS3-18913)
(NASA-CR-134790; SD75-SA-0043) Avail: NTIS HC $8.50 CSCL 21H

Design concepts are considered that permit use of a liquid-liquid (as opposed to gas-gas) oxygen/hydrogen thrust chamber for attitude control and auxiliary propulsion thrusters on the space tug. The best of the auxiliary propulsion system concepts are defined and their principal characteristics, including cost as well as operational capabilities, are established. Design requirements for each of the major components of the systems, including thrusters, are developed at the conceptual level. The competitive concepts considered use both dedicated (separate tanks) and integrated (propellant from main propulsion tanks) propellant supply. The integrated concept is selected as best for the space tug after comparative evaluation against both cryogenic and storable propellant dedicated systems. A preliminary design of the selected system is established and recommendations for supporting research and technology to further the concept are presented. Author

N75-24842*# Rockwell International Corp., Downey, Calif. Space Div.
SOLAR ELECTRIC PROPULSION SYSTEM THERMAL ANALYSIS Final Report, 27 Dec. 1973 - 27 Feb. 1975
28 Feb. 1975 193 p refs
(Contract NAS8-30542)
(NASA-CR-120770; SD-75-SA-0012) Avail: NTIS HC $7.00 CSCL 21C

Thermal control elements applicable to the solar electric propulsion stage are discussed along with thermal control concepts. Boundary conditions are defined, and a thermal analysis was conducted with special emphasis on the power processor and equipment compartment thermal control system. Conclusions and recommendations are included. Author

N75-24843*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION OF REFRACTORY-METAL-CLAD URANIUM NITRIDE AND URANIUM DIOXIDE FUEL PINS AFTER IRRADIATION FOR TIMES UP TO 10 450 HOURS AT 990 C
Kenneth J. Bowles and Richard E. Gluyas Washington Jun. 1975 64 p refs
(NASA-TN-D-7891; E-7988) Avail: NTIS HC $4.25 CSCL 21F

The effects of some materials variables on the irradiation performance of fuel pins for a lithium-cooled space power reactor design concept were examined. The variables studied were UN fuel density, fuel composition, and cladding alloy. All pins were irradiated at about 990 C in a thermal neutron environment to the design fuel burnup. An 85-percent dense UN fuel gave the best overall results in meeting the operational goals. The T-111 cladding on all specimens was embrittled, possibly by hydrogen in the case of the UN fuel and by uranium and oxygen in the case of the UO2 fuel. Tests with Cb-1Zr cladding indicate potential use of this cladding material. The UO2 fueled specimens met the operational goals of less than 1 percent cladding strain, but other factors make UO2 less attractive than low-density UN for the contemplated space power reactor use. Author

N75-24844*# Scientific Translation Service, Santa Barbara, Calif.
LIQUID COOLING OF COMPONENTS, SUCH AS ROCKET COMBUSTION CHAMBERS AND METHODS OF CONSTRUCTION
C. H. Dederra and K. Butter Washington NASA Jun. 1975 14 p refs Transl. into ENGLISH from West German Patent (Appl. no. 1264160, 15 Dec. 1966)
(Contract NASw-2483)
(NASA-TT-F-16397) Avail: NTIS HC $3.25 CSCL 21H

A manufacturing process is described for highly stressed rocket and projectile components. These components are first cooled by liquids on the vehicle; the cracks between components are then filled with a material having an electrically conductive surface. The mechanically strong and hermetic layer is applied over the surface using a galvanoplastic method. The filling material is melted away to complete the process. Author

N75-24845*# LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
PHASE 2 STUDY OF IMPROVED MATERIALS FOR USE ON SCOUT ROCKET MOTOR NOZZLES Final Report
R. D. Stutzman [1975] 34 p refs
(Contract NAS1-10500)
(NASA-CR-132679) Avail: NTIS HC $3.75 CSCL 21H

Nozzle material performance data were obtained, and the feasibility was determined of using new materials on the Scout rocket motor nozzles. Stress and heat transfer analyses were conducted to aid in the selection of optimum materials for nozzle tests. A reimpregnated and graphitized throat insert was fabricated along with two nozzles with ablative throats. The dissection and determining of char and erosion of two nozzles fired on X-259 loaded cases are discussed; one of the nozzles used a graphite phenolic ablative throat insert, and the other unit was a standard X-259 nozzle with a reduced area ATJ graphite throat insert. Author

N75-24846# Westinghouse Electric Corp., Pittsburgh, Pa. Astronuclear Lab.
NERVA PROGRAM NRX-A6 TEST PLAN
Apr. 1966 12 p Sponsored by ERDA
(WANL-TNR-212) Avail: NTIS HC $3.25

Overall plans for the NRX-A6 Test Series are outlined. It is planned to run the reactor at full power for one hour, and to evaluate performance in the start-up and operating regions and control of systems in particular (aiming for simple, reliable control methods with stable operation over the range needed). The flow and instrumentation systems will also be evaluated. NSA

N75-24847# Massachusetts Inst. of Tech., Cambridge. Space Propulsion Lab.
RESEARCH ON CHARGED ALKALI COLLOIDS FOR AEROSPACE VEHICLE AND GROUND BASED POWER GENERATION Final Report, 10 Feb. 1972 - 7 Feb. 1974
Albert Solbes and Manuel Martinez Jan. 1975 121 p refs
(Contract F33612-72-C-1258; AF Proj. 7116)
(AD-A008182; ARL-75-0004) Avail: NTIS CSCL 10/2

Results of the study of the fundamental physical processes and measurement of properties aimed at predicting the performance of two fluid liquid metal vapor EFD converters are presented. The condensation studies indicate that substantial alkali boiler concentrations (30% cesium) are required to produce appreciable

homogeneous nucleation in alkali amalgam vapors. The case of heterogeneous condensation about ions is also studied. The results of breakdown studies for amalgam vapor mixtures with helium, nitrogen, and hydrogen show the latest gas to be the most desirable choice for efficient conversion. Generator studies indicate the existence of contact charging of liquid mercury droplets with surfaces of higher work function. The behavior of the generator is seen to depend strongly on the amount of recirculated condensate and current. An analysis is presented for the efficiency of neutralization of charges at the collector.
GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N75-24848*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPACECRAFT MATERIALS GUIDE
Charles L. Staugaitis, ed. Washington 1975 77 p
(NASA-SP-3094) Avail: NTIS HC $4.75 CSCL 11G

Materials which have demonstrated their suitability for space application are summarized. Common, recurring problems in encapsulants and conformal coatings, optical materials, lubrication, and bonding and joining are noted. The subjects discussed include: low density and syntactic foams, electrical encapsulants; optical glasses, interference filter, mirrors; oils, greases, lamillar lubricants; and, soldering and brazing processes. L.B.

N75-24849# McDonnell Aircraft Co., St. Louis, Mo.
INTRASYSTEM ELECTROMAGNETIC COMPATIBILITY ANALYSIS PROGRAM. VOLUME 1: USER'S MANUAL ENGINEERING SECTION Final Report, 19 May 1972 - 19 Nov. 1973
J. L. Bogdanor, R. A. Pearlman, and M. D. Siegel Dec. 1974 319 p refs 4 Vol.
(Contract F30602-72-C-0277)
(AD-A008526; RADC-TR-74-342-Vol-1) Avail: NTIS CSCL 09/3

The user's manual describes the operation and usage of the Intrasystem Electromagnetic Compatibility Analysis Program (IEMCAP). IEMCAP is a USA Standard FORTRAN program for computer-aided implementation of electromagnetic compatibility (EMC) at all stages of an Air Force system's life cycle, applicable to aircraft, space/missile, and ground-based systems. Extensive knowledge of computers is not required to use the program and all inputs are in easy to use, free-field format. The volume, the Engineering Section, contains descriptions of the program, its organization, analytic basis, operating principles, and logic flow. The system model employed in IEMCAP for the various analysis tasks is presented. The systems approach is derived from basic communications equations in analytic form and then quantized to sampled spectra for digital computers. The volume also contains a discussion of the program operation. GRA

N75-24850# Stanford Research Inst., Menlo Park, Calif.
OXIDATION OF SULFUR AND AMINE MODEL COMPOUNDS Quarterly Progress Report, Sep.-Dec. 1974
T. Mill, L. Piszkiewicz, F. Mayo, and C. Gould Apr. 1975 16 p refs
(Contract DAAA15-74-C-0150; DA Proj. 1W7-62710-AD-60)
(AD-A008441; SRI-PYU-3280-3; EC-CR-75) Avail: NTIS CSCL 07/3

This study is directed toward evaluating these different ways of activating oxygen to oxidize sulfur and amine simulants for toxic agents at useful rates. Free-radical initiated and photooxidation of dibutyl sulfide (Bu2S) and ethyl diisopropylamine (i-Pr2NEt) were studied. GRA

N75-24851# California Univ., Los Angeles. Dept. of Chemistry.
HYDROLYSIS AND METHANOLYSIS OF THE SMALL CARBORANES 1,5-C2B3H5, 1,6-C2B4H6, AND 2,4-C2B5H7; THE PREPARATION OF THE 1,3,5-TRIBORAPENTANE DERIVATIVES (RO)2BCH2B(OR)CH2B(OR)2, (R EQUALS Me OR H)
Mar. 1975 17 p refs
(Contract N00014-71-C-0072)
(AD-A008414) Avail: NTIS CSCL 07/3

The order of reactivity toward methanol and water for three small close-carboranes is 1,5-C2B3H5 = 2,4-C2B5H7 = 1,6-C2B4H6. The smallest carborane reacts rapidly with both reagents to form initially the triborapentane, (RO)2BCH2B(OR)CH2B(OR)2 (R = Me, H). The other two carboranes give smaller cleavage products, B(OR)3, MeB(OR)2 and (RO)2BCH2B(OR)2. The mass spectra of both (MeO)2BCH2B(OMe)CH2B(OMe)2 and (MeO)2BCH2B(OMe)2 are discussed. GRA

N75-24852# Bureau of Mines, Laramie, Wyo. Energy Research Center.
THE IDENTIFICATION OF GAMMA-VALEROLACTONE IN WASTE FROM AN OIL-SHALE IN SITU RETORT
F. R. McDonald Nov. 1974 13 p refs
(PB-240098/4; BM-RI-7918) Avail: NTIS HC $3.25 CSCL 07C

The compound gamma-valerolactone was identified in an acid fraction isolated from waste water collected from an in situ oil-shale retort. Infrared, nuclear magnetic resonance, and mass spectrometry are used to confirm the identification of the fraction collected from a gas chromatograph. GRA

N75-24853# Mississippi Univ., University. Dept. of Chemical Engineering.
A STUDY OF THE REACTIONS OF PHENANTHRENE OVER A CHROMIA-ALUMINA CATALYST USING A STEADY STATE CATALYTIC MICROREACTOR M.S. Thesis
Wen-Lung Wu Jun. 1974 109 p refs Sponsored by NSF
(PB-239276/9; NSF/RA/N-74-148) Avail: NTIS HC $5.25 CSCL 07C

A steady-state catalytic microreactor was constructed to conduct a brief study of the hydrocracking of phenanthrene. Chromia alumina was the selected catalyst because of its demonstrated ability to catalyze free radical reactions. The range of conditions investigated were: Temperature 800-1000F, pressure 2000-3000 psig, and space velocity 0.5-6.0 gm/hr/gm. The reaction products were analyzed by gas chromatography. Three major hydrogenation reaction paths were identified. One provides a means of hydrocracking condensed multiring aromatics to low molecular weight species while consuming a minimum amount of hydrogen. GRA

N75-24854# Bureau of Mines, College Park, Md. Metallurgy Research Center.
INFRARED SPECTRA OF COMPOUNDS OF IMPORTANCE IN LEAD SULFIDE FLOTATION Report of Investigations
Roy L. Wilfong and Edwin E. Maust, Jr. Nov. 1974 71 p refs
(PB-240101/6; BM-RI-7963) Avail: NTIS HC $4.25 CSCL 07C

Infrared reference spectra are presented of compounds of importance in lead sulfide flotation research. Included are the spectra of several short chain alkyl xanthates of lead and zinc, the corresponding dixanthogen compounds and the common oxidation products of lead sulfide and their sodium analogs. The spectra of several much-used industrial flotation reagent xanthates are also presented. A thorough, well documented discussion is given the various corrections made to correct the as-recorded absorption band data to near absolute values. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N75-24855*# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.
A NOTE ON A BROKEN LAYER IN AN ORTHOTROPIC LAMINATE COMPOSITE
K. Arin Mar. 1974 17 p refs
(Grant NGR-39-007-011)
(NASA-CR-142903; TR-74-4; IFSM-74-59) Avail: NTIS

HC $3.75 CSCL 20K

An orthotropic laminate composite containing a completely broken layer is considered. The problem is formulated in terms of integral transforms and then reduced to a singular integral equation which is solved numerically. The strength of stress singularity at the crack tip is determined from a characteristic equation which is obtained by studying the dominant part of the singular integral equation near the end points. The stress intensity factors are given for various material properties. Author

N75-24856*# Lockheed-Georgia Co., Marietta.

THE FABRICATION, TESTING AND DELIVERY OF BORON/EPOXY AND GRAPHITE/EPOXY NONDESTRUCTIVE TEST STANDARDS **Final Report**

W. M. Pless and W. H. Lewis Dec. 1971 70 p
(Contract NAS8-27565)
(NASA-CR-61374; ER-11199) Avail: NTIS HC $4.25 CSCL 11D

A description is given of the boron/epoxy and graphite/epoxy nondestructive test standards which were fabricated, tested and delivered to the National Aeronautics and Space Administration. Detailed design drawings of the standards are included to show the general structures and the types and location of simulated defects built into the panels. The panels were laminates with plies laid up in the 0 deg, + or - 45 deg, and 90 deg orientations and containing either titanium substrates or interlayered titanium perforated shims. Panel thickness was incrementally stepped from 2.36 mm (0.093 in.) to 12.7 mm (0.500 in.) for the graphite/epoxy standards, and from 2.36 mm (0.093 in.) to 6.35 mm (0.25 in.) for the boron/epoxy standards except for the panels with interlayered shims which were 2.9 mm (0.113 in.) maximum thickness. The panel internal conditions included defect free regions, resin variations, density/porosity variations, cure variations, delaminations/disbonds at substrate bondlines and between layers, inclusions, and interlayered shims. Ultrasonic pulse echo C-scan and low-kilovoltage X-ray techniques were used to evaluate and verify the internal conditions of the panels. Author

N75-24857*# Northrop Research and Technology Center, Hawthorne, Calif.

DAMAGE COEFFICIENTS IN LOW RESISTIVITY SILICON **Final Report, Jul. 1973 - Nov. 1974**

J. R. Srour, S. Othmer, K. Y. Chiu, and O. L. Curtis, Jr. May 1975 95 p refs
(Contract NAS3-17849)
(NASA-CR-134768; NRTC-75-23R) Avail: NTIS HC $4.75 CSCL 11D

Electron and proton damage coefficients are determined for low resistivity silicon based on minority-carrier lifetime measurements on bulk material and diffusion length measurements on solar cells. Irradiations were performed on bulk samples and cells fabricated from four types of boron-doped 0.1 ohm-cm silicon ingots, including the four possible combinations of high and low oxygen content and high and low dislocation density. Measurements were also made on higher resistivity boron-doped bulk samples and solar cells. Major observations and conclusions from the investigation are discussed. Author

N75-24858*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

SKYLAB PARASOL MATERIAL EVALUATION

Stephen Jacobs Apr. 1975 34 p
(NASA-TM-X-58161; JSC-09452) Avail: NTIS HC $3.75 CSCL 11D

Results of experimental work to evaluate the degradation rate of a parasol that was used as a means of alleviating thermal problems encountered soon after the launch of the Skylab 1 space vehicle are presented. Material selection criteria are discussed; the material chosen is described, and results of tests performed after environmental exposure at five facilities are given. The facilities used for exposure to ultraviolet radiation/thermal-vacuum environments and the equipment used for testing physical properties before and after exposure are described. Comparisons of ground test and flight test data are included. Author

N75-24859# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.

SOME MECHANICAL PROPERTIES OF PHASE SEPARATED Pd.74 Au.08 Si.18 METALLIC GLASSES

C. P. Peter Chou and Frans Spaepen Apr. 1975 18 p refs
(Contract N00014-67-A-0298-0036; NR Proj. 032-544)
(AD-A008327; TR-515) Avail: NTIS CSCL 11/6

The effect of phase separation and crystallization of glassy Pd(.74)Au(.08)Si(.18) on its tensile behavior, fracture strength, hardness and fracture morphology has been investigated. The results are discussed in terms of the dilation mechanism for flow. GRA

N75-24860# Army Foreign Science and Technology Center, Charlottesville, Va.

STRENGTH AND DEFORMABILITY OF FIBERGLASS REINFORCED PLASTICS SUBJECTED TO BIAXIAL COMPRESSION

F. P. Belyankin, V. F. Yatsenko, and G. G. Margolin 21 May 1974 178 p refs Transl. into ENGLISH of the book "Prochnost i deformativnost stekloplastikov pri dvukhosnom szhatii" Kiev, Nauka Dumka Press, 1971 153 p
(AD-A008517; FSTC-HT-23-747-74) Avail: NTIS CSCL 11/4

Problems of strength, resistance, and deformability of structural fiberglass-reinforced plastics on cloth and noncloth base in biaxial compression are examined. Emphasis is placed on the effect of the time factor in the case of long-term strength in creep conditions. It was found that in biaxial compression of fiberglass-reinforced plastics with constant loading, the creep curves may be nonmonotonic. GRA

N75-24861# Stanford Research Inst., Menlo Park, Calif.

COMPUTATIONAL REPRESENTATION OF CONSTITUTIVE RELATIONS FOR POROUS MATERIAL **Final Report, 24 Jan. 1973 - 31 Mar. 1974**

Lynn Seaman, Robert E. Tokheim, and Donald R. Curran May 1974 171 p refs
(Contract DNA001-73-C-0119; SRI Proj. PYU-2407; DNA Proj. NWED-QAXA)
(AD-A007921; DNA-3412F) Avail: NTIS CSCL 20/12

Porous materials are used as a protection against X-radiation because of their ability to minimize the stress generated by the radiation and to attenuate that stress as it propagates. For accurate design of this protection, wave propagation calculations are made to simulate the radiation deposition, stress generation, propagation, and spallation caused by stress waves. For such a calculation it is necessary to have a constitutive relation (stress-strain-energy relation, or equation of state) that describes the material's response to heating and to compressive and tensile loading. The objective of this report is to document a set of constitutive relations that provide for: Elastic and plastic compaction loading with rate dependence; Heating or cooling that can occur simultaneously with loading; Unloading and rate-dependent fracture; and, Melting and vaporization, with explicit treatment of solid, liquid, vapor, and mixed phases. Accompanying these relations is a user's manual that includes a derivation of the equations for the model and procedures for using it in Lagrangian wave propagation computer programs. GRA

N75-24862# Ohio State Univ. Research Foundation, Columbus.

FINITE ELEMENT ANALYSIS OF ANISOTROPIC PLATES USING Q-19 ELEMENT. PART 1: THEORETICAL DEVELOPMENT **Final Report, Nov. 1972 - Jul. 1973**

Iqbal S. Rai and Ranbir S. Sandhu Oct. 1974 126 p refs
(Contract F33615-72-C-2193; AF Proj. 4364)
(AD-A002921; OSURF-3613-73-IF-Pt-1; AFFDL-TR-74-120-Pt-1) Avail: NTIS CSCL 11/4

A fully compatible quadrilateral plate bending element, designated Q-19 was developed by Clough and Felippa. A summary formulation was reported in AFFDL-TR-68-150. However, a computer program employing such a finite element was not available to the Air Force. This report presents a more complete formulation of the element properties and includes a computer program. Part 1 of the report contains the theoretical development and part 2 contains a listing of the FORTRAN code as well as instructions for usage. GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N75-24863 British Library Lending Div., Boston Spa (England).
METHODS OF PURIFICATION OF SODIUM
J. Coron and P. Lecocq 14 May 1974 22 p refs Transl. into ENGLISH from Energie Nucl. (Paris), v. 13, no. 6, 1971 p 428-435
(BLL-CE-Trans-5974-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

A bibliographical study was made of the problems involved in the purification of sodium. The main impurities encountered in the sodium contained in the circuits are listed, and their sources and effects examined, after which various methods of purifying the sodium are described, with particular emphasis on purification by cold trap. Author

N75-24864*# Nebraska Univ., Lincoln. Behlen Lab. of Physics.
VIBRATIONAL INTENSITY DISTRIBUTIONS IN THE PHOTOELECTRON SPECTRUM OF HYDROGEN
J. L. Gardner and James A. R. Samson [1975] 11 p refs Sponsored in part by NSF
(Grant NGR-28-004-021)
(NASA-CR-142931) Avail: NTIS HC $3.25 CSCL 07D

The intensity distribution over the $H_2(+)$ vibrational levels up to a quantum number of 15 was measured for H_2 photoelectron spectra at a photon wavelength of 584 A. The data show reasonable agreement with recent calculations only in the quantum number of 0 through 8. The higher levels are populated significantly lower than predicted by theory. Author

N75-24865*# Scientific Translation Service, Santa Barbara, Calif.
THE THERMODYNAMIC PROPERTIES OF CARBIDES
A. S. Bolgar, A. G. Turchanin, and V. V. Fesenko Washington NASA Jun. 1975 431 p refs Transl. into ENGLISH from the book "Termodinamicheskiye Svoistva Karbidov" Kiev, Izdatel'stvo Naukova Dumka, 1973 272 p
(Contract NASw-2483)
(NASA-TT-F-16213) Avail: NTIS HC $11.25 CSCL 07D

The thermodynamic properties of carbides of various elements of the periodic table are discussed and tabulated for a wide temperature range. Information is given concerning the heat capacity, excess enthalpy, entropy, and thermodynamic potentials of the carbides, as well as rates of vaporization, vapor pressures, and heats of formation of these substances. The thermodynamic properties are related to the types of chemical bonds that are found in these compounds. Author

N75-24866*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DETERMINATION OF HYDROXIDE AND CARBONATE CONTENTS OF ALKALINE ELECTROLYTES CONTAINING ZINC
Dumas A. Otterson Washington Jun. 1975 12 p refs
(NASA-TN-D-8007; E-8304) Avail: NTIS HC $3.25 CSCL 07D

A method to prevent zinc interference with the titration of OH^- and CO_3^{-2} ions in alkaline electrolytes with standard acid is presented. The Ba-EDTA complex was tested and shown to prevent zinc interference with acid-base titrations without introducing other types of interference. Theoretical considerations indicate that this method can be used to prevent interference by other metals. Author

N75-24867*# Kanner (Leo) Associates, Redwood City, Calif.
OPTICAL-ACOUSTICAL METHOD OF GAS ANALYSIS
P. V. Slobodskaya, Ya. I. Gerlovin, and M. L. Veyngerov Washington NASA 20 Jun. 1975 3 p Transl. into ENGLISH from Byul. Izobret. (USSR), no. 5, 1960 (US Patent no. 126657) 2 p
(Contract NASw-2481)
(NASA-TT-F-16418) Avail: NTIS HC $3.25 CSCL 07D

An invention which determines the quantitative ratio of gases in a mixture by the amplitude of the pressure generated by absorption of infrared radiation is presented. It measures the phase shift of the pressure oscillation relative to the phase of modulated radiation, and for quantitative analysis of gas mixtures, which do not absorb infrared radiation, a specific quantity of an infrared absorbing gas can be introduced to facilitate analysis. Author

N75-24868*# Kanner (Leo) Associates, Redwood City, Calif.
AN INVESTIGATION OF VOLATILE SUBSTANCES EMITTED BY POLYMERS INTENDED FOR VARIOUS PURPOSES
V. D. Yablochkin, A. M. Popov, E. G. Chukhno, Ye. V. Kolchina, A. I. Gorshunova, and V. A. Shchirskaya Washington pub NASA Jun. 1975 7 p refs Transl. into ENGLISH from Gigiena i Sanit. (USSR), no. 2, 1972 p 25-28
(Contract NASw-2481)
(NASA-TT-F-16402) Avail: NTIS HC $3.25 CSCL 07D

Gas chromatography, spectrophotometry, and chemical analysis were used to determine the quantitative and qualitative composition of gaseous products emitted by polymers intended for various purposes. At a temperature of 40 C the gaseous products consisted mainly of organic solvents and their admixtures. At a high temperature (125 and 200 C) nonspecific and specific products of thermooxidative destruction were formed. Author

N75-24869*# Kanner (Leo) Associates, Redwood City, Calif.
METHOD FOR INFRARED ANALYSIS OF SUBSTANCES, ESPECIALLY GASES, BY SELECTIVE ABSORPTION OF ONE RADIATION BEAM, USING EQUIPMENT DESIGNED FOR THIS METHOD
Jiri Janac Washington NASA Jun. 1975 8 p Transl. into ENGLISH of Czechoslovakian Patent no. 119625 (Appl. no. 122-65, 7 Jan. 1965) 4 p
(Contract NASw-2481)
(NASA-TT-F-16417) Avail: NTIS HC $3.25 CSCL 07D

A method for infrared analysis of substances was designed for general use; its operational parameters and components are described. After a radiation beam is passed through the substance to be analyzed, the same beam continues through two successive absorption chambers containing receiving substances. Comparison and measurement cuvettes were designed to facilitate the setting of the zero measurement value. L.B.

N75-24870# Sandia Labs., Albuquerque, N.Mex.
EQUILIBRIUM GAS COMPOSITIONS OF METAL-CARBON-CHLORINE-HYDROGEN SYSTEMS
M. L. Lieberman and J. L. Wurtz Jan. 1975 45 p refs
(Contract AT(29-1)-789)
(SAND-74-0235) Avail: NTIS HC $3.75

Thermodynamic calculations of equilibrium gas compositions were performed for M-C-Cl-H systems, where M represents Nb, W, Ti, and Zr, for single- and multiphase conditions. The effects of temperature, pressure, atomic ratios, and number of phases on the concentrations of the various species were evaluated for each system. Author (NSA)

N75-24871# Oak Ridge National Lab., Tenn. Analytical Chemistry Div.
[INSTRUMENTATION AND ADVANCED METHODOLOGY FOR ENVIRONMENTAL ANALYSIS] Annual Progress Report, period ending 30 Sep. 1974
W. S. Lyon, comp. Jan. 1975 107 p refs
(Contract W-7405-eng-26)
(ORNL-5006) Avail: NTIS

The use of electrochemical and spectrochemical methods for environmental analysis is investigated. Hadamard transfrom spectroscopy is evaluated for application in the ultraviolet and visible spectral regions. Various instruments developed included a revised voltammeter, a battery-operated potentiostat-galvanostat, and an electronic fusion package for fluorometric uranium analysis. Computer applications include: pattern recognition techniques for complex analytical data, and interface for gas chromatography, and an expanded program text for the computer-controlled atomic absorption spectrophotometer. Analytical schemes for the determination of organomercury compounds using a combined gas chromatograph-microwave emission spectrometer are investigated and perfected. A procedure devised for the analysis of Cr(VI) in natural water by pulse polarography is presented. NSA

N75-24872# Atomic Energy of Canada Ltd., Chalk River (Ontario).
CHARACTERIZATION OF DISLOCATIONS AND LARGE DISLOCATION LOOPS USING ELECTRON MICROSCOPY
G. J. C. Carpenter Dec. 1974 21 p refs
(AECL-5023) Avail: ERDA Depository Libraries HC $4.25; Atomic Energy of Can., Ltd., Chalk River $0.50

An account is presented of the experimental techniques for analyzing dislocations and loops using transmission electron microscopy. It is emphasized that care is necessary in the choice of diffraction conditions for Burgers vector analysis using the GX b=0 invisibility criterion. The techniques used to identify the character (vacancy or interstitial) of large dislocation loops are described in detail. Particular attention is paid to the case of perfect loops which are not of pure edge character, where appropriate orientations and diffraction vectors must be employed to obtain unambiguous results. Attention is drawn to the use of an incorrect sign convention for the characterization of imperfect, Frank loops. The measurement of loop size is discussed. Author (NSA)

N75-24873# Aerospace Corp., El Segundo, Calif.
VIBRATIONAL RELAXATION OF HCl (V=1,2,3,6) Interim Report
Roger L. Wilkins 25 Feb. 1975 36 p refs
(Contract F04701-74-C-0075)
(AD-A008161; SAMSO-TR-75-74; TR-0075(5530)-9) Avail: NTIS CSCL 07/4

Rate coefficients are calculated for the collisional de-excitation of vibrationally excited HCl molecules by H and Cl atoms. Three-dimensional classical trajectories of the collisional dynamics of these reactions are calculated by using London-Eyring-Polanyi-Sato (LEPS) potential-energy surfaces. The results indicate that (1) the rapid deactivation of vibrationally excited HCl by H and Cl atoms can be explained if bound complexes are postulated for both HClH and ClHCl, (2) H- and Cl atom exchange are efficient mechanisms for relaxing vibrationally excited HCl by Cl and H atoms, respectively, (3) multiple quantum-transitions are important in these de-excitation processes, and (4) the major energy transfer processes are vibration to translation in the deactivation of HCl by H atoms and vibration to rotation in the deactivation of HCl by Cl atoms. GRA

N75-24874# Aerospace Corp., El Segundo, Calif.
FLOW TUBE STUDIES OF THE DEACTIVATION OF HF(V) BY SELECTED POLYATOMIC MOLECULES Interim Report
Munson A. Kwok and Norman Cohen 27 Feb. 1975 38 p refs
(Contract F04701-74-C-0075)
(AD-A008162; TR-0075(5530)-8; SAMSO-TR-75-76) Avail: NTIS CSCL 07/4

A large-diameter, medium-pressure flow tube has been used to study deactivation processes by selected polyatomic molecules that are potentially relevant in chemical laser systems. Effective vibrational deactivation rate constants for HF relaxed by H_2S, CO_2, N_2O, CH_4, CF_4, and SF_6 are determined. The role of the HF rotational energy in absorbing a vibrational energy defect is examined. An experimental correlation with adjusted vibrational energy defect is suggested. Author

N75-24875# Litton Systems, Inc., Morris Plains, N.J. Airtron Div.
PRODUCTION ENGINEERING FOR GROWTH OF SYNTHETIC CALCITE POLARIZER MATERIAL Final Report, Jul. 1971 - Jul. 1974
Roger F. Belt, D. Reed Kinloch, and Richard C. Puttbach Aug. 1974 135 p refs
(Contract DAAB05-71-C-2636)
(AD-A008043; R11-599) Avail: NTIS CSCL 20/2

A preliminary production engineering program was completed for the growth of synthetic calcite for crystal polarizers. Starting materials were powdered high purity $CaCO_3$, natural calcite of uniform composition, or solution recrystallized $CaCO_3$. Both 1.5 and 3.0 inch diameter autoclaves were used to establish most growth variables. Solutions of 6 m K_2CO_3 were used for mineralizers. Techniques were perfected for the operation of silver lined autoclaves with 9.0 inch diameter x 9 feet long cavities. For runs extending up to 60 days, about 3 - 4 mm thick sections of new material were grown on seeds. A number of chemical and physical tests established the high quality reproduction of natural calcite which is used in conjunction with electrooptically Q switched lasers. GRA

N75-24876# Coast Guard Academy, New London, Conn.
THE EVALUATION OF THE TEST PROCEDURE FOR HAZARDOUS BINARY COMBINATIONS OF MATERIALS IN MARINE TRANSPORTATION Final Report
Anthony T. Wehman 30 Aug. 1974 84 p refs
(AD-A007915; USCG-D-85-75) Avail: NTIS CSCL 07/4

The proposed test procedure for the evaluation of binary combinations of hazardous materials encountered in marine transportation was checked and verified to be safe, easy to perform, and to give valid and meaningful data. Present data agrees well with that previously published in a Dow report and a recent Norwegian publication. Approximately 100 new binary combinations have been tested, and a reproducibility study was performed. An abbreviated study of variables was undertaken. GRA

N75-24877# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SPACECRAFT SELF-CONTAMINATION BY MOLECULAR OUTGASSING
Robert L. Harvey 31 Mar. 1975 64 p refs
(Contract F19628-73-C-0002; AF Proj. 649L)
(AD-A008504; TN-1975-1; ESD-TR-75-147) Avail: NTIS CSCL 07/4

The contamination of spacecraft surfaces from ambient and outgassing molecules is considered. A model is formulated for the molecules desorbed from the spacecraft surfaces and scattered by the ambient molecules back to the emitting and adjacent surfaces. Equations are derived for the backscatter and far-field cases as a function of surface geometry, mean free path, and desorbing beam shape. Expressions are given for point to point and flat surface to point scattering. The scattered molecular irradiance is combined with other sources to obtain the total molecular irradiance. A calculation of the contamination during launch of the Lincoln Experimental Satellites 8 and 9 is given. GRA

N75-24878# Block Engineering, Inc., Cambridge, Mass.
REMOTE DETECTION OF THE HYDRONIUM ION Final Report, 27 Jun. 1973 - Jun. 1974
Stanley M. Klainer Mar. 1975 64 p refs
(Contract F30602-73-C-0360; AF Proj. 0173)
(AD-A008521; BEI-74-624; RADC-TR-75-66) Avail: NTIS CSCL 07/4

It was demonstrated that the hydronium ion can be remotely measured in acid solution and in acid aerosols. A Raman Spectrometric technique has been developed which indirectly measures aqueous acid concentrations. The approach is to measure the effect that acids and their salts have on the structure of the water solvent. Quantitative measurements of aqueous acid and salt solutions have been made for various concentrations. GRA

N75-24879# Cornell Univ., New York.
DYNAMICS OF THE CHEMISTRY OF ELECTRONICALLY EXCITED ATOMS IN DEFINED QUANTUM STATES Annual Summary Report, 1 Apr. 1974 - 31 Mar. 1975
John R. Wiesenfield 15 Apr. 1975 21 p refs
(Contract N00014-67-A-0077-0030; NR Proj. 014-505)
(AD-A008570) Avail: NTIS CSCL 07/4

The work described in this report involved the experimental and theoretical investigation of the chemistry of electronically excited atoms and molecules. The oxidation of Ba atoms by N_2O was examined in terms of correlation rules based on the conservation of angular momentum. A mechanism was proposed for the observed efficient production of electronically excited BaO molecules. The photochemistry of alkyl iodides was studied using time-resolved atomic absorption spectrometry. The electronic structure of the iodides plays a profound role in determining the yield of electronically excited iodine atoms produced in the initial photolytic step. Collisional processes involving the alkyl radicals produced in the photolysis of these molecules were also monitored and their role in the photochemical iodine laser is currently being considered. GRA

N75-24880# Case Western Reserve Univ., Cleveland, Ohio. Electrochemistry Research Lab.
THEORY OF CHARGE TRANSFER ELECTROCHEMICAL INTERFACES: A REVIEW
R. K. Sen, E. Yeager, and W. E. OGrady 15 Feb. 1975 57 p refs
(Contract N00014-67-A-0404-0006; NR Proj. 359-451)
(AD-A008398; TR-41) Avail: NTIS CSCL 07/4

This report reviews the considerable progress made over the past decade in the development of theoretical aspects of the elementary acts of both electron and proton transfer at metal electrode-electrolyte interfaces. Specific theoretical treatments reviewed in some detail include: (1) Outer sphere electron transfer: the Marcus-Hush and Levich-Dogonadze-Kuznetsov treatments and modifications of such (Schmidt, Schmickler-Vielstich, Kestner-Logan-Jortner); (2) Bridge-assisted electron transfer: the treatment of the Dogonadze group; (3) Proton transfer: the activated complex approach with and without proton tunnelling (Brockris-Matthews, Conway-Salomon, Christov), BEBO approach (Salomon-Enke-Conway, Bockris-Sen); the non-equilibrium solvent polarization model (Dogonadze-Kuznetsov-Levich). GRA

N75-24881# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
SOLUBILITY AND DIFFUSIVITY OF OXYGEN IN NICKEL AND COBALT Final Report, Sep. 1969 - Mar. 1972
William R. Kerr Feb. 1975 19 p refs
(AF Proj. 7021)
(AD-A008474; ARL-75-0019) Avail: NTIS CSCL 07/4

The solubility and diffusivity of oxygen in nickel has been determined by the method of solid electrolyte coulometric titration, for the temperature range 1000 to 1250 C. The solubility of oxygen in nickel does not obey the Sieverts' Law relationship expected for such low concentration. Expressions for solubility and diffusivity are reported. GRA

N75-24882# Case Western Reserve Univ., Cleveland, Ohio. Electrochemistry Research Lab.
THE DISSOLUTION KINETICS OF LITHIATED NiO IN AQUEOUS ACID SOLUTIONS
Chin-Ho Lee, Alan Riga, and E. Yeager 15 Jan. 1975 22 p refs
(Contract N00014-67-A-0404-0006; NR Proj. 359-451)
(AD-A008426; TR-40) Avail: NTIS CSCL 07/4

The factors controlling the dissolution of metal oxides are of major importance in understanding the role of such oxides in the control of corrosion through the formation of passivation films and the use of various oxides as battery cathodes. The dissolution kinetics of mosaic lithiated nickel oxide have been examined in concentrated H_2SO_4 and HCl solutions as a function of potential and found to be strongly dependent on potential with the rate increasing with increasingly anodic potentials and passing through a maximum in the H_2SO_4 solutions. The temperature dependence indicates Arrhenius behavior with an enthalpy of activation of 23 kcal/mole. Complexing agents such as EDTA have been found to increase the dissolution rate. At relatively anodic potentials, O18 labelling experiments indicate that the generation of O_2 involves to a significant extent lattice O(-2), probably through a mechanism involving the p-carriers falling into O(-2) surface states. GRA

N75-24883# Pennsylvania State Univ., University Park. Dept. of Chemistry.
STUDIES IN THE KINETICS AND THERMODYNAMICS OF SUBLIMATION Final Report, 1 Jun. 1964 - 31 Jan. 1975
Gerd M. Rosenblatt Feb. 1975 40 p refs
(Grants DA-31-124-ARO(D)-302; DA-ARO(D)-31-124-72-G91; DA-ARO(D)-31-124-G555; DA-ARO(D)-31-124-G1072; DA Proj. 200-61102-B-13B)
(AD-A008433; ARO-4847-31C) Avail: NTIS CSCL 07/4

Measurements were made of the rate of vaporization of arsenic and antimony single crystals under varied conditions. Measurements were also made of reaction rates with molecular oxygen. Changes in surface morphology accompanying sublimation of arsenic, antimony, potassium chloride, and other substances were followed in order to elucidate the vaporization mechanism of these solids which have low vaporization coefficients. A zipper mechanism appears to describe the vaporization of arsenic. Ultra high vacuum studies of cendensation and crystal growth were carried out on arsenic. A method and apparatus were developed to determine translational and internal energy accommodation coefficients. Thermodynamic properties of the As, As_2O_3, Sb, Sb_2O_3, and SeO_2 systems were determined. GRA

N75-24884# California Univ., Los Angeles. Dept. of Chemistry.
THE ORIENTATION OF THE MAGNETIC AXES OF QUINOXALINE AND 2,3-DICHLOROQUINOXALINE TRIPLETS IN A DURENE HOST CRYSTAL FROM PMDR METHODS
Paul E. Zinsli and M. A. El-Sayed 28 Mar. 1975 14 p refs
(Contract N00014-69-A-0200-4012; NR Proj. 056-498)
(AD-A008436; TR-21) Avail: NTIS CSCL 07/4

The polarizations of the zero-field (zf) transitions of quinoxaline and 2,3-dichloroquinoxaline in durene have been measured at 1.6K by phosphorescence microwave double resonance methods. From the results, the orientation of the magnetic axes of the triplet state of these molecules relative to the host lattice has been determined. Quinoxaline is found to dissolve substitutionally in durene, as has been concluded from ESR, while the magnetic axes of 2,3-dichloroquinoxaline are found to be rotated by 12 + or - 4 degrees around the short molecular axis. GRA

N75-24885# Picatinny Arsenal, Dover, N.J.
ELECTRICAL AND PHOTOGRAPHIC CHARACTERIZATION OF LOW INTENSITY CAPACITOR SPARK DISCHARGES
C. R. Westgate, M. S. Kirshenbaum, and B. D. Pollock Feb. 1975 36 p refs
(DA Proj. 1W6-62617-AH-79)
(AD-A008356; PA-TR-4737) Avail: NTIS CSCL 19/1

Some properties of the gaseous discharges normally used in electrostatic initiation of primary explosives are determined from electrical and photographic studies. It is shown that the magnitude of the postbreakdown current can determine the form of the discharge. For currents larger than about 0.3 amp, the discharge is essentially an arc characterized by a low (15-30 v) voltage drop across the gap. For currents less than 0.1 amp, the discharge is essentially a spark or glow discharge characterized by a voltage drop of approximately 300 volts across the gap. In both cases, the voltages and the transition current are only slightly affected by variations in the gap length. GRA

N75-24886# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
THE EFFECT OF REACTIVE PROCESSING ON WINDOW PROPERTIES OF NaCl
A. Armington, H. Posen, J. Bruce, and H. Lipson Jan. 1975 15 p refs Presented at the 4th Ann. Conf. on Infrared Laser Window Mater., 6th Session, Tucson, Ariz., 18-20 Nov. 1974
(AF Proj. 3326)
(AD-A008478; AFCRL-TR-75-0171) Avail: NTIS CSCL 20/2

The effect of reactive atmosphere processing (RAP) on single crystals of sodium chloride is studied with respect to defect chemistry, substructure, mechanical properties and optical absorption at 10.6 micrometers. A variety of reactive atmospheres are compared, including carbon tetrachloride, and several Freon-based compounds. These atmospheres were used in both Bridgman and Czochralski grown crystals. Yield and rupture strengths were measured for these crystals using four-point bending methods. Typical stress-strain curves are presenteb. Crystals examined after yielding, using X-ray topography techniques, exhibited pronounced glide bands in the (1,0,1) planes in the (1,0,-1) directions as expected for materials of rock salt structure. Optical absorption measurements at 10.6 micrometers using calorimetric techniques and a 50 watt laser show some improvement in the absorption of reactive processed crystals over that of non RAP processed crystals. GRA

N75-24887# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

PREPARATION AND PROPERTIES OF SINGLE CRYSTAL ZnSe Interim Report
J. J. Larkin, R. M. Hilton, H. G. Lipson, and N. Klausutis Jan. 1975 9 p ref Presented at the 4th Ann. Conf. on Infrared Laser Window Mater., Tucson, Ariz., 18-20 Nov. 1974
(AF Proj. 5620)
(AD-A008479; AFCRL-TR-75-0169) Avail: NTIS CSCL 20/2

Growth of ZnSe has been investigated by a variety of techniques. Polycrystalline boules of this material have been pulled from the stoichiometric melt by the liquid encapsulated Czochralski (LEC) technique. Single crystals have been produced by chemical vapor transport (CVT) with iodine vapor and by a modified Bridgman method suggested by Fischer under high pressure. LEC Czochralski boules grown from Cerac starting materials were polycrystalline. Cerac ZnSe was transported through a temperature gradient at 820C by I2 vapors. A general reduction in all impurities was determined by mass spectrographic analysis. Crystal quality is good in the lower half of Bridgman boules. GRA

N75-24888# Naval Academy, Annapolis, Md. Environmental Protection Research and Development Team.
HYDROGEN PEROXIDE TREATMENT OF EFFLUENT RESULTING FROM WET AIR OXIDATION OF SHIPBOARD WASTES Final Report, 1 Jul. - 31 Dec. 1974
Edward Koubek 13 Jan. 1975 12 p refs
(AD-A008155; USNA-EPRD-6) Avail: NTIS CSCL 07/5

A method of oxidizing certain refractory organics using photochemically activated hydrogen peroxide is discussed. Emphasis is placed on the removal of acetate ion found in effluents resulting from wet oxidation of organic wastes. The kinetics and mechanism of the process are discussed along with the possible advantages of the method over metal ion-catalyzed hydrogen peroxide oxidation. GRA

N75-24889# Pennsylvania State Univ., University Park. Materials Research Lab.
VIBRATIONAL SPECTRA OF TERNARY RARE EARTH SULFIDES IN RELATION TO CRYSTAL STRUCTURES
Steven I. Boldish, Paul L. Provenzano, Larry E. Drafall, and William B. White 15 Sep. 1974 18 p refs
(Contract F19628-71-C-0232; AF Proj. 5620)
(AD-A008493; SR-7; AFCRL-TR-74-0477) Avail: NTIS CSCL 20/2

The role of bond length and coordination of a series of rare earth sulfides with the A2BS4 stoichiometry on vibrational spectra was investigated. Far infrared and Raman spectra were measured on compounds with A=La, De, Nd, Pr; B=Ba, Sr, Pb, Ca (TH3P4)(structure 143d); A=Gd to Lu, B=Ba, Sr, Eu(2+) (CaFe2O4)(structure Pnam); and A= Ho, Er, Tm, Yb, Y; B=Zn, Mg, Cd (spinel structure Fd3m). Band frequencies shift normally with cell parameters and show discontinuous shifts to lower values as the coordination scheme is varied from 6-4 to 8-6 to 8-9. GRA

N75-24890# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE LIFETIME OF A SINGLET-OXYGEN MOLECULE IN SOME SOLUTIONS
T. Kajiwara 25 Feb. 1975 19 p refs Transl. into ENGLISH from Bussei (Japan), v. 15, no. 1, 1974 p 15-23
(AD-A007934; FTD-HC-23-0880-75) Avail: NTIS CSCL 07/4

Excited oxygen was obtained by transmitting the energy from the excited dye to oxygen in reaction solutions of peroxide and sodium chlorites in a mu-discharge phase. The lifetime of excited oxygen in solutions and the chemical radiation and effect of deuterium oxides are also discussed. M.J.S.

N75-24891# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DETERMINATION OF THE PARTICLE SIZE DISTRIBUTION OF POWDERS BY MEANS OF A PHOTOSEDIMENTOGRAPH
J. M. H. Fortuin and J. M. G. Prop 12 Mar. 1975 24 p refs Transl. into ENGLISH from Chemisch Weekblad (Netherlands), no. 57, 1961 p 489-494
(AD-A007943; FTD-HC-23-0637-75) Avail: NTIS CSCL 07/4

A method is described for determining the particle size distribution (1 - 40 micrometers) of small powdered samples (5 - 30 mg). The measurement is carried out with a photosedimentograph consisting of a Leitz-sedimentometer, a light source of constant intensity, a commercial recorder, a thermostat, and some other accessories. The analysis is semi-automatic, and leads to accurate results within only one hour. GRA

N75-24892# Utah Univ., Salt Lake City. Dept. of Chemistry.
THEORETICAL AND EXPERIMENTAL INVESTIGATIONS OF (1) REACTION KINETICS. (2) THEORY OF LIQUIDS AND (3) OPTICAL ROTATION Final Report, 1 May 1962 - 31 Aug. 1974
Henry Eyring 14 Feb. 1975 25 p refs
(Contract DA-31-124-ARO(D)-408; Grants DA-ARO(D)-31-124-G298; DA-ARO(D)-31-124-G1051; DA-ARO(D)-31-124-G1110; DA-ARO(D)-31-124-G5; DA-ARO(D)-31-124-G15)
(AD-A008095; ARO-3383.34-C) Avail: NTIS CSCL 07/4

References and summaries of research are presented. Topics include high pressure chemistry, spectroscopy, magnetic circular dichroism studies of structure, reaction rates, chemical analysis liquid structure, electrochemistry and reaction rates-applied. GRA

N75-24893# Aerospace Corp., El Segundo, Calif. Lab. Operations.
VIBRATIONAL DEACTIVATION OF HF(V EQUALS 1) AND DF(V EQUALS 1) BY H AND D ATOMS Interim Report
R. F. Heidner, III and J. F. Bott 31 Mar. 1975 37 p refs
(Contract F04701-74-C-0075)
(AD-A008510; TR-0075(5240-40)-2; SAMSO-TR-75-80) Avail: NTIS CSCL 07/4

The deactivation of HF(v = 1) and DF(v = 1) by H and D atoms was studied at 295 K by means of the techniques of laser induced infrared fluorescence and isothermal calorimetry. The upper limits for the deduced rate coefficients are well defined, but the lower limits are imprecise. The results of this study are compared with other experimental data and with trajectory calculations. Qualitative data are presented regarding the role of reactive, i.e., F-atom exchange, versus nonreactive collisions in the removal of the v = 1 level. A verification of the method was made by determining a rate coefficient for H + HCl(v = 1) that is in good agreement with a recent study. Author

N75-24894# Stanford Research Inst., Menlo Park, Calif. Molecular Physics Center.
INVESTIGATION OF ION-ION RECOMBINATION CROSS SECTIONS Final Report, 19 Oct. 1971 - 18 Oct. 1974
R. A. Bennett, D. L. Huestis, J. T. Moseley, D. Mukherjee, and R. E. Olson 27 Nov. 1974 132 p refs
(Contract F19628-72-C-0121; DNA Proj. NWET-S99QAXH)
(AD-A007972; SRI-MP-74-50; AFCRL-TR-74-0417) Avail: NTIS CSCL 07/4

An experimental and theoretical investigation of ion-ion mutual neutralization was made. Two-body neutralization rates were measured for NO(+) + O2(-), N2(+) + NO2(-), and N(+) - O(+) over the energy range from above 10 eV to 0.15 eV, and the results extrapolated and thermally averaged to yield reaction rates at 300K. In addition, preliminary measurements were obtained on O(+) + OH(-) and NO(+) + OH(-)-H2O, and a few data obtained on N2(+) + OH(-)-H2O. An investigation of excited states in ion beams did not reveal the presence of any such states, but did allow measurements of electron loss cross sections for O(-), O2(-), NO2(-) and NO3(-) on a variety of atoms and molecules at energies from 1 to 4 keV. The theoretical program has been directed toward understanding the processes by which clustered ions are neutralized. The most favorable process is orbital capture of one ion by the other due to coulomb excitation of the internal degrees of freedom of the clusters. A variety of calculations were performed on the neutralization of NO(+) by O(-). GRA

N75-24895# Little (Arthur D.), Inc., Cambridge, Mass.
FEASIBILITY INVESTIGATIONS OF GROWING AND CHARACTERIZING GALLIUM ARSENIDE CRYSTALS IN RIBBON FORM Quarterly Report, 26 Jun. - 30 Sep. 1974
Nov. 1974 43 p refs
(Grant NsF GI-43093)
(PB-239279/3; ADL-77371;

NSF/RANN/SE/GI-43093/PR-74-3; NSF/RA/N-74-135; QR-3) Avail: NTIS HC $3.75 CSCL 20B

Preliminary analysis of molten zone stability in three alternative configurations showed that a two-tape sandwich support holds the greatest promise for achieving the desired flat ribbon crystal structure. The single tape support system has potential difficulty in crystal separation; a free submerged molten zone is a backup alternative that may warrant further investigation. Indication heating of GaAs by direct RF coupling was shown to be feasible and best achieved with a high frequency generator. Benchtop feasibility experiments identified arsenic evolution from the molten zone as a potential problem that can be overcome by control of zone configuration and materials composition. GRA

N75-25522 Joint Publications Research Service, Arlington, Va.
METHOD FOR SAMPLING CONDENSING MICROIMPURITIES OF EXHALED AIR FOR SUBSEQUENT ANALYSIS BY THE GAS CHROMATOGRAPHY METHOD
Ye. Ye. Sotnikov *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 120-124 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 73-75 (For availability see N75-25505 16-51)

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N75-24896 British Library Lending Div., Boston Spa (England).
HEAT TREATMENT OF STEELS AND WELDED JOINTS
H. Staudinger 11 Nov. 1974 24 p refs Transl. into ENGLISH from Werkstattstechnik (Berlin), v. 63, no. 8, 1973 p 445-452 (BLL-CE-Trans-6547-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

The practical application of the iron/carbon phase diagram, and the effect of faster cooling of steels on their structure and properties are discussed. A description is presented of the importance of time/temperature transformation diagrams for the explanation of structural changes and of the occurrence of internal stresses. The conventional and more recent methods of heat treatment are discussed: isothermal transformations, austenitic forming hardening, maraging, precipitation and dispersion hardening, hardening and quenching from hot-forming temperature, and the treatment of highly stressed welded joints are described. The possibilities of improving the strength and structural properties and the practical application of internal stresses are considered. Author

N75-24897*# Tyco Labs., Inc., Waltham, Mass.
DIRECTIONALLY SOLIDIFIED LAMELLAR EUTECTIC SUPERALLOYS BY EDGE-DEFINED, FILM-FED GROWTH Final Report
G. F. Hurley Apr. 1975 53 p refs
(Contract NAS3-18909)
(NASA-CR-134808) Avail: NTIS HC $4.25 CSCL 11F

A program was performed to scale up the edge-defined, film-fed growth (EFG) method for the gamma/gamma prime-beta eutectic alloy of the nominal composition Ni-19.7 Cb - 6 Cr-2.5 Al. Procedures and problem areas are described. Flat bars approximately 12 x 1.7 x 200 mm were grown, mostly at speeds of 38 mm/hr, and tensile tests on these bars at 25 and 1000 C showed lower strength than expected. The feasibility of growing hollow airfoils was also demonstrated by growing bars over 200 mm long with a teardrop shaped cross-section, having a major dimension of 12 mm and a maximum width of 5 mm. Author

N75-24898*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EFFECTS OF POROSITY ON WELD-JOINT TENSILE STRENGTH OF ALUMINUM ALLOYS
C. V. Lovoy Sep. 1974 65 p refs
(NASA-TM-X-64933) Avail: NTIS HC $4.25 CSCL 11F

Tensile properties in defect-free weldments of aluminum alloys 2014-T6 and 2219-T87 (sheet and plate) are shown to be related to the level or concentration of induced simulated porosity. The scatter diagram shows that the ultimate tensile strength of the weldments displays the most pronounced linear relationship with the level of porosity. The relationships between yield strength or elongation and porosity are either trivial or inconsequential in the lower and intermediate levels of porosity content. In highly concentrated levels of porosity, both yield strength and elongation values decrease markedly. Correlation coefficients were obtained by simple straight line regression analysis between the variables of ultimate tensile strength and pore level. The coefficients were greater, indicating a better correlation, using a pore area accumulation concept or pore volume accumulation than the accumulation of the pore diameters. These relationships provide a useful tool for assessing the existing aerospace radiographic acceptance standards with respect to permissible porosity. In addition, these relationships, in combination with known design load requirements, will serve as an engineering guideline in determining when a weld repair is necessary based on accumulative pore level as detected by radiographic techniques. Author

N75-24899*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FRACTOGRAPHY OF THE HIGH TEMPERATURE HYDROGEN ATTACK OF A MEDIUM CARBON STEEL
Howard G. Melson and R. Dale Moorhead May 1975 20 p refs Presented at Symp. on Fractography-Microscopic Cracking Processes, 78th Ann. Meeting of ASTM, Montreal, 23-27 Jun. 1975
(NASA-TM-X-62435; A-6079) Avail: NTIS HC $3.25 CSCL 11F

Microscopic fracture processes were studied which are associated with hydrogen attack of a medium carbon steel in a well-controlled, high-temperature, high-purity hydrogen environment. Exposure to a hydrogen pressure and temperature of 3.5 MN/m2 and 575 C was found to degrade room temperature tensile properties with increasing exposure time. After 408 hr, yield and ultimate strengths were reduced by more than 40 percent and elongation was reduced to less than 2 percent. Initial fissure formation was found to be associated with manganese rich particles, most probably manganese oxide, aligned in the microstructure during the rolling operation. Fissure growth was found to be associated with a reduction in carbide content of the microstructure and was inhibited by the depletion of carbon. The interior surfaces of sectioned fissures or bubbles exhibit both primary and secondary cracking by intergranular separation. The grain surfaces were rough and rounded, suggesting a diffusion-associated separation process. Specimens that failed at room temperature after exposure to hydrogen were found to exhibit mixed mode fracture having varying amounts of intergranular separation, dimple formation, and cleavage, depending on exposure time. Author

N75-24900*# Scientific Translation Service, Santa Barbara, Calif.
THE MANUFACTURE OF PLATE COMPOSITE MATERIALS MADE OF UNALLOYED STEEL, STAINLESS METALS AND ACID-RESISTANT METALS
J. Moeller Washington NASA Jun. 1975 20 p refs Transl. into ENGLISH from Metall (Berlin), v. 26, no. 8, Aug. 1972 p 820-825
(Contract NASw-2483)
(NASA-TT-F-16427) Avail: NTIS HC $3.25 CSCL 11F

The history of plating methods for tubes and sheets of steel over the past 100 years is outlined. Experiments in applying titanium to stainless and acid resistant steels in the form of tubes are briefly described. Copper is found to be a good intermediate layer between the titanium and the steel. Author

N75-24901# Royal Aircraft Establishment, Farnborough (England).
FOILS AND THIN TAPES CONSISTING OF ALUMINIUM
Wilhelm Keese Mar. 1975 22 p Transl. into ENGLISH from Z. Metallk. (Stuttgart), v. 61, no. 4, 1970 p 245-251
(RAE-Lib-Trans-1497; BR47625) Avail: NTIS HC $3.25

Information is given on standards for measurement, material, and testing, and also on attainable standardized values for foils and thin tapes constructed from aluminum and aluminum alloys. Hot, cold and finish rolling on single stands or on tandem mills, the theory and practice of final annealing, and indications concerning different methods of further processing are described. Descriptions of the degree of rolling and the rolling speed, the type and duration of annealing, curves of strength values for various degrees of purity of the aluminum, and the pore count in aluminum foils from 5 to 9 micrometers are included. Author

N75-24902# Royal Aircraft Establishment, Farnborough (England).
THE INFLUENCE OF PRIOR CREEP ON THE FATIGUE STRENGTH OF AK4-1-T1 ALLOY
A. V. Vorobev, S. I. Olkin, and V. N. Stebenev Mar. 1975 13 p refs Transl. into ENGLISH from Uch. Zap. TSAGI (USSR), v. 3, no. 2, 1972 p 120-126
(RAE-Lib-Trans-1836; BR47624) Avail: NTIS HC $3.25

Results from an experimental study of the effects of prior creep at moderately elevated temperatures on the fatigue characteristics of notched specimens of Ak4-1-T1 alloy are given. It was shown that the effect of creep on fatigue strength is governed by a large number of factors which may either decrease or increase life. These include: structural changes and relaxation of manufacturing residual stresses, dependent on the long term action of temperature, residual stresses formed in regions of stress concentration as a result of nonuniform total creep, cold working, and formation of microcracks or voids. Author

N75-24903*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A FILM-RUPTURE MODEL OF HYDROGEN-INDUCED, SLOW CRACK GROWTH IN ALPHA-BETA TITANIUM
Howard G. Nelson Jun. 1975 24 p refs
(NASA-TM-X-62440; A-6088) Avail: NTIS HC $3.25 CSCL 11F

The appearance of the terrace like fracture morphology of gaseous hydrogen induced crack growth in acicular alpha-beta titanium alloys is discussed as a function of specimen configuration, magnitude of applied stress intensity, test temperature, and hydrogen pressure. Although the overall appearance of the terrace structure remained essentially unchanged, a distinguishable variation is found in the size of the individual terrace steps, and step size is found to be inversely dependent upon the rate of hydrogen induced slow crack growth. Additionally, this inverse relationship is independent of all the variables investigated. These observations are quantitatively discussed in terms of the formation and growth of a thin hydride film along the alpha-beta boundaries and a qualitative model for hydrogen induced slow crack growth is presented, based on the film-rupture model of stress corrosion cracking. Author

N75-24904# State Univ. of New York, Stony Brook. Coll. of Engineering.
APPLICATIONS OF MICRODYNAMICS AND LATTICE MECHANICS TO PROBLEMS IN PLASTIC FLOW AND FRACTURE Progress Report, 1 Jan. - 31 Dec. 1974
J. C. Bilello and J. M. Liu 1974 18 p refs
(Contract AT(11-1)-3476)
(COO-3476-9) Avail: NTIS HC $3.25

The fracture of bcc tungsten, molybdenum, and hcp zinc crystals was experimentally investigated. Results show that (1) plastic relaxation occurs in bcc tungsten and molybdenum at 77 K; (2) 50% of the measured surface energy is due to plastic work dissipated by dislocation activities; (3) zinc is highly sensitive to testing temperature and testing speed, implying a strong influence of plasticity in fracture at low temperatures. High frequency ultrasonic attenuation measurements in Cu and Cu-Ni alloys demonstrated the failure of existing theories to account quantitatively for this attenuation in deformed crystals. Author (NSA)

N75-24905# Argonne National Lab., Ill.
FRAGMENTATION OF MOLTEN MATERIALS DROPPED INTO WATER
D. H. Cho, W. H. Gunther, and D. R. Armstrong Dec. 1974 22 p refs
(Contract W-31-109-eng-38)
(ANL-8155) Avail: NTIS HC $3.25

A series of experiments were performed to investigate the fragmentation of a hot molten material in a cold quench liquid. Small quantities of various molten materials (less than 1 g) were dropped into a pool of water and the projected areas of the resulting fragments were measured for the extent of fragmentation. Materials having low melting points were used: tin, bismuth, silver chloride, zinc, and lead. The dropping distance was kept constant at 2 in. from the water surface while the temperatures of the molten samples and water were varied over a wide range. Author (NSA)

N75-24906# Dow Chemical Co., Golden, Colo. Rocky Flats Div.
PLUTONIUM-GALLIUM ALLOYS: ANNOTATED BIBLIOGRAPHY
R. J. Jackson and P. A. Kneale 17 Jan. 1975 39 p refs
(Contract AT(29-1)-1106)
(RFP-2227) Avail: NTIS HC $3.75

An annotated bibliography current as of January 1, 1974, on binary plutonium-gallium alloys was prepared from NSA entries and additional sources. Arranged in two parts, Part 1--Journal Articles, Formal Reports, and Patents, contains some 115 annotated references. Part II--Progress Reports and Newsletters has some 13 references. Included are a subject index, source (organizations) data, and an author index. Author (NSA)

N75-24907# Dow Chemical Co., Golden, Colo. Rocky Flats Div.
URANIUM-NIOBIUM-ZIRCONIUM ALLOYS: ANNOTATED BIBLIOGRAPHY. PART 1: JOURNAL ARTICLES, FORMAL REPORTS, AND PATENTS. PART 2: PROGRESS REPORTS AND NEWSLETTERS
R. J. Jackson and P. A. Kneale 31 Dec. 1974 50 p refs
(Contract AT(29-1)-1106)
(RFP-2158-Pt-2) Avail: NTIS HC $3.75

An annotated bibliography (approximately 207 references) current as of September 1, 1973, was prepared on ternary uranium-niobium-zirconium alloys. Most of the materials were obtained from Nuclear Science Abstract entries and to a lesser extent from other sources. Included are a subject index, source (organizations) data, and an author index. Author (NSA)

N75-24908# Central Electricity Generating Board, Berkeley (England). Nuclear Labs.
EFFECT OF SODIUM CARBON ACTIVITY UPON THE CREEP FRACTURE OF STAINLESS STEEL
W. Charnock Aug. 1974 31 p refs
(RD/B/N-3159) Avail: ERDA Depository Libraries HC $4.75

Creep tests were performed on notched and plain specimens of AISI 316 stainless steel in low and high (0.11 < ac < 1) carbon activity sodium at 600 C and at general section stresses of 164 to 192N/mm2. The endurance of notched specimens was markedly reduced in high carbon activity sodium whereas plain specimens were relatively unaffected by the environment. The notch region extension method was applied to two specimens which had been tested in high but different sodium carbon activities. Endurance was shorter, cracks were sharper, and crack propagation was faster in the higher carbon activity case in spite of the fact that the stress was also lower. A rudimentary model is proposed in which the rate of crack opening is controlled by creep in the ligament and is hence substantially independent of the environment, while there is a critical crack tip displacement or strain for crack extension by a characteristic dimension, t, which is a function of crack tip carburization. Author (NSA)

N75-24909# Sandia Labs., Albuquerque, N.Mex.
MECHANICAL BEHAVIOR OF OXIDE FREE STAINLESS STEEL SURFACES IN A LOW PRESSURE HYDROGEN ENVIRONMENT
R. E. Cuthrell Jan. 1975 41 p refs
(Contract AT(29-1)-789)
(SAND-74-0376) Avail: NTIS HC $3.75

Results are presented of an investigation of the environment-sensitive mechanical behavior of 440C stainless steel, a material which has potential for applications in the hydrogen economy. The removal of surface oxides was found to soften the material, and reversible hardening/softening was observed on absorbing/desorbing hydrogen in the metal at room temperature. The presence of small amounts of carbon monoxide in the environment was observed to halt both the absorption and the desorption of hydrogen in the steel. Expressions were derived, in terms of the material properties and taking into account the behavior of persistent surface asperities, for the treatment of contact resistance-load data. Both contact resistance and laser interference microscopic measurements gave consistent results for the surface mechanical behavior. Author (NSA)

N75-24910# Rochester Univ., N.Y.
DIFFUSIONAL CREEP OF MULTICOMPONENT SYSTEMS Progress Report, 1 Feb. 1974 - 31 Jan. 1975
J. C. M. Li 31 Jan. 1975 17 p
(Contract AT(11-1)-2296)
(COO-2296-7) Avail: NTIS HC $3.25

As part of the study of the interaction between prismatic loops, graphs are given which show the free energy of formation of one loop in the vicinity of another. The multiple creep processes in UO2 are being studied. Strain volumes and the effects of stress on defect equilibria are calculated. Equipment was constructed for penetration creep measurements; data are given for a succinonitrile single crystal. NSA

N75-24911# Oak Ridge National Lab., Tenn.
FUELS AND MATERIALS DEVELOPMENT PROGRAM Quarterly Progress Report, Period Ending 30 Sep. 1974
P. Patriarca Jan. 1975 201 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4726) Avail: NTIS HC $7.25

Research results are reported on properties of advanced neutron absorber materials, fabrication and inspection of steam generator materials, properties of LMFBR structural and component materials, and properties of LMFBR stainless steel weldments. NSA

N75-24912# Oak Ridge Y-12 Plant, Tenn.
VARIABLES WHICH INFLUENCE THE STRESS CORROSION CRACKING OF URANIUM-7.5 NIOBIUM-2.5 ZIRCONIUM ALLOY
J. W. Koger 28 Jan. 1974 21 p refs
(Contract W-7405-eng-26)
(Y-1965) Avail: NTIS HC $3.25

More positive electric potentials, lower pHs, increasing chloride content, and increasing stresses decrease the time to failure of uranium-7.5 wt % niobium-2.5 wt % zirconium alloy (mulberry). Increasing amounts of chlorides increase the general corrosion rate of mulberry. In chloride solutions and above the yield stress, all failure times are short regardless of the chloride content, pH, or potential. Author (NSA)

N75-24913# California Univ., Los Angeles. Dept. of Minerals.
REACTOR STEELS STUDIES Quarterly Progress Report, Jan. - Jun. 1974
K. Ono, A. J. Ardell, and A. S. Tetelman Oct. 1974 10 p refs
(Contract AT(04-3)-34)
(UCLA-34P177-22) Avail: NTIS HC $3.25

Activities on studies of the mechanical properties of Cr-Mo steels and stainless steels are reported. NSA

N75-24914# Utah Univ., Salt Lake City.
IMPURITY EFFECTS ON THE CREEP OF POLYCRYSTALLINE MAGNESIUM AND ALUMINUM OXIDES AT ELEVATED TEMPERATURES Progress Report, 19 Dec. 1973 - 18 Dec. 1974
Ronald S. Gordon Dec. 1974 40 p refs
(Contract AT(11-1)-1591)
(COO-1591-27; UTEC-MSE-75-1002) Avail: NTIS HC $3.75

Nonviscous creep of large grain size MgO, doped with iron, viscous creep of fine-grained, high purity MgO, the effect of grain size on creep of polycrystalline Al2O3, doped with iron, and stress relaxation of polycrytalline MgO and Al2O3, pure and doped with iron and chromium are experimentally investigated. It is shown that the power law creep of iron-doped MgO is independent of the iron dopant level, grain size, and oxygen partial pressure. Viscous creep is identified in fine grained MgO by relating the transient creep behavior to simultaneous grain growth indicating that (1) magnesium lattice and grain boundary diffusion contribute to the creep rate; (2) iron doping enhances magnesium lattice diffusion and suppresses cation grain boundary diffusion; (3) increased iron dopant levels and/or decreasing oxygen partial pressures increase cation lattice diffusion in polycrystalline Al2O3 such that oxygen grain boundary diffusion becomes rate-limiting in diffusional creep. Author (NSA)

N75-24915# Michigan Technological Univ., Houghton. Dept. of Metallurgical Engineering.
STUDY OF GRAIN BOUNDARY SEGREGATION USING THE AUGER ELECTRON EMISSION TECHNIQUE Annual Technical Progress Report, 1 Jan. - 31 Dec. 1974
D. F. Stein and L. A. Heldt 1974 21 p refs
(Contract AT(11-1)-2166)
(COO-2166-21; ATPR-4) Avail: NTIS HC $3.25

The segregation of impurities to grain boundaries was studied in nickel and nickel-based alloy systems. In nickel it was found that embrittlement did not occur until precipitation had occurred, but in Ni-Al and Ni-Al-Ti it appears that segregation without precipitation causes embrittlement. In Ni-Al and Ni-Al-Ti alloys, it was found that interaction of sulfur decreased with increasing temperature. This was explained on the basis of a distribution of energy sites associated with the grain boundary. It was demonstrated through the combined use of auger electron spectroscopy and energy dispersive X-ray analysis that stress corrosion cracking of copper base alloys was a consequence of the continuous formation of an oxide and its subsequent fracture. In ferritic stainless steels, it was demonstrated that chromium depletion within 10 atomic layers of the grain boundary area was responsible for the intergranular attack in boiling 65% nitric acid. Author (NSA)

N75-24916# Iowa State Univ. of Science and Technology, Ames.
STRUCTURE AND PROPERTIES OF STEELS THERMOMECHANICALLY PROCESSED BY IMPACT EXTRUSION Ph.D. Thesis
V. F. Mayer Nov. 1974 128 p refs
(Contract W-7405-eng-82)
(IS-T-3470) Avail: NTIS HC $5.75

Several steels (AISI 4340, 440A stainless steel, AISI 1020) were thermomechanically treated by impact extruding their metastable austenites at various temperatures and extrusion ratios directly into a quenching medium of oil. The effectiveness of this process was assessed by comparing tensile test results of the impact extruded steel with those from the same steel given conventional heat treatment. Thermomechanical treatment using impact extrusion as the deformation process increases the strength of steel about the same amount as thermomechanical treatments using conventional deformation processes like rolling. Increases in yield strength of as much as 14% and 24% were measured for AISI 4340 and 440A respectively. These strength increases are not accompanied by significant decreases in area reduction or elongation; a result typical of thermomechanical treatments. Transmission electron micrographs of steels given both thermomechanical treatment and conventional heat treatment were compared, the austenite grain size after extrusion was observed and measured by optical microscopy. Author (NSA)

N75-24917# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. d'Etudes des Combustibles a Base de Plutonium
CONTRIBUTION TO THE STUDY OF POINT DEFECTS IN STAINLESS STEELS Ph.D. Thesis - Paris Univ., France
A. Azarian Nov. 1974 84 p refs In FRENCH
(CEA-R-4617) Avail: ERDA Depository Libraries HC $7.25

Vacancies were studied in a stainless steel Cr 18 - Ni 14 of very low impurity content, except for phosphorus, which was added in small and controlled quantities. Vacancies were studied by the positron annihilation technique; the formation energy was found equal to 1.6 + or - 0.2 eV in the phosphorus-free steel and 1.2 + or - 0.2 eV in the 0.05% phosphorus steel. Vacancy clusters formed after quenching were also studied by electron microscopy. The 1/3 /111/ Frank loop was observed in all the steels. In phosphorus steels 1/2 /110/ perfect loops and stacking fault tetrahedra were observed after respectively slow and fast quenches. Author (NSA)

N75-24918# Utah Univ., Salt Lake City. Div. of Materials Science and Engineering.
IMPURITY AND GRAIN SIZE EFFECTS ON THE CREEP OF POLYCRYSTALLINE MAGNESIA AND ALUMINA
P. A. Lessing and R. S. Gordon Jul. 1974 26 p refs Presented at Symp. on Plastic Deformation of Ceramics, University Park, Pa., 17 Jul. 1974
(Contract AT(11-1)-1591)
(COO-1591-26; Conf-740724-5; UTEC-MSE-74-110) Avail: NTIS HC $3.75

Steady state, constant load, and creep experiments were conducted on pure and doped polycrystalline magnesium and aluminum oxides to determine: the effect of solid solution impurities (e.g. Fe, Cr, Ti) on deformation mechanisms, particularly as they relate to the concentration of lattice defects; the effects of impurities, atmosphere, and grain size on the relative contribution to viscous deformation of lattice and grain boundary diffusion of both cationic and anionic species; and the relative roles of viscous and nonviscous deformation mechanisms. Author (NSA)

N75-24919# Carnegie-Mellon Univ., Pittsburgh, Pa. Metal Physics Lab.
INVESTIGATION ON THE LOW TEMPERATURE SPECIFIC HEAT OF fcc ALLOYS CHARGED WITH HYDROGEN Final Report
T. B. Massalski 1974 53 p refs Sponsored by ERDA Prepared for Calif. Univ., Livermore. Lawrence Livermore Lab.
(UCRL-13615) Avail: NTIS HC $4.25

Measurements of the electronic specific heat coefficient were made within the narrow range of the alpha-phase of Pd-H alloys. The effects of alloying, deformation by compression, room temperature deformation, aging and deformation at liquid N2 temperature followed by aging at room temperature were investigated. Results are interpreted. NSA

N75-24920# Mar-Test, Inc., Cincinnati, Ohio.
FATIGUE, TENSILE, AND RELAXATION BEHAVIOR OF STAINLESS STEELS
J. B. Conway, R. H. Stenz, and J. T. Berling 1975 276 p refs Sponsored by ERDA
(TID-26135) Avail: NTIS

Data and information are presented on short-term tensile, relaxation, and low-cycle fatigue behavior of stainless steels. Chapters are included on low-cycle-fatigue test procedures, low-cycle fatigue data, cumulative-damage concepts, short-term tensile data, and relaxation behavior. NSA

N75-24921# European Space Research Organization, Paris (France).
THE INFLUENCE OF THE LOADING RATE ON THE SUBCRITICAL CRACK GROWTH OF TiAl6V4 AND AlZnMgCu 1.5 IN AIR AND IN A CORROSIVE ENVIRONMENT
Friedrich Link Mar. 1975 97 p refs Transl. into ENGLISH of "Einfluss der Belastungsgeschwindigkeit auf das unterkritische Risswachstum mit u. ohne Korrosionseinwirkung bei TiAl6V4 u. AlZnMgCu1,5", DFVLR, Porz, West Ger. Report DLR-FB-74-14, 29 Jan. 1974 Original German report available from DFVLR, Porz, West Ger. 35.60 DM
(ESRO-TT-148; DLR-FB-74-14) Avail: NTIS HC $4.75

The influence of the loading rate on fracture toughness and stress corrosion cracking of TiAl6V4 and AlZnMgCu 1.5 was investigated. It was found that fracture toughness and critical corrosion cracking stress intensity of AlZnMgCu 1.5 are constant, while fracture toughness of TiAl6V4 first decreases as the loading rate increases, passes through a minimum, and then increases as the loading rate continues to increase. The critical corrosion cracking stress intensity increases only at very slow loading rates, but remains constant over the remainder of the range. It was possible to relate the variation of both values of fracture toughness and critical stress intensity in the case of Ti Al6 V4 to the dependency on the loading rate of the fracture toughness curves. ESRO

N75-24922# Bureau of Domestic Commerce, Washington, D.C.
COPPER, VOLUME 21, NUMBER 1, OCTOBER 1974
Rodney A. Joseph Oct. 1974 19 p
(COM-74-50063/01) Avail: NTIS MF $2.25; SOD HC $0.50 also available on subscription CSCL 11F

A series of statistics selected from the U.S. Government and other relevant sources, reflecting recent trends in the Cu production and fabrication industries is given. Statistics showing relationships of industry trends to overall activity are included. Data are given in tabular form and cover: shipments and unfilled orders, inventories, foundry data, employment, prices, foreign trade, and foreign countries data. E.H.W.

N75-24923# McDonnell Aircraft Co., St. Louis, Mo.
EVALUATION OF THE RELIABILITY AND SENSITIVITY OF NDT METHODS FOR TITANIUM ALLOYS, VOLUME 2 Final Report, 1 May 1972 - 31 Jan. 1974
Robert J. Lord Jun. 1974 373 p refs
(Contract F33615-72-C-1203; AF Proj. 7351)
(AD-A001604; AFML-TR-73-107-Vol-2) Avail: NTIS CSCL 11/6

The report describes the work conducted on a program designed to improve nondestructive testing techniques and, then, to evaluate the capability and reproducibility of the improved nondestructive testing techniques for the evaluation of discontinuities occurring in titanium. Reported are penetrant dwell times, penetrant bleed-out times, developer types, emulsification times, and water washing parameters required to effectively penetrant inspect parts which may contain a variety of crack sizes and porosity. Both post-emulsifiable and water washable fluorescent penetrants were investigated. The effect of kilovoltage on radiographic contrast sensitivity is discussed. Ultrasonic inspection of contour surfaces is reported and methods for improving near-surface resolution are documented. Methods for ultrasonic inspection of thin machined parts are reported. GRA

N75-24924# California Univ., Los Angeles. School of Engineering and Applied Science.
NEW TECHNIQUES FOR THE SYNTHESIS OF METALS AND ALLOYS, 1. THE PROPERTIES OF RARE EARTH METALS AND ALLOYS, 2 Final Report, 1 Jul. 1970 - 30 Jun. 1974
R. F. Bunshah Nov. 1974 84 p refs
(Grant DAHC15-70-G-15; ARPA Order 1643)
(AD-A008403; UCLA-ENG-7520) Avail: NTIS CSCL 11/6

The investigation consisted of two parts. In part one, a High Rate Physical Vapor Deposition Process was developed for the deposition of metals, alloys, compounds and dispersion strengthened alloys. The relationship between the deposition temperature, the microstructure and the mechanical properties was studied. The materials resulting from this process were shown to have properties very similar to true engineering materials. These deposition techniques have been developed to the stage where they can be applied to the production of self-supporting shapes or coatings for engineering applications. The second part of this investigation was concerned with the study of the oxidation mechanism of Ni3Al containing yttrium. GRA

N75-24925# National Bureau of Standards, Washington, D.C.
ANALYSIS OF PROPOSED AIR DRYING PROCESS Quarterly Report
Lewis Greenspan Dec. 1974 12 p refs Sponsored in part by NASA
(NASA-CR-142856; COM-75-10208/7; NBSIR-74-631) Avail: NTIS HC $3.25

An air drying process has been analyzed which is intended to reduce the water vapor content of a stratospheric sample to below one part per million by weight, based upon the removal of the water as it passes through a phosphorous pentoxide absorber. The analysis indicates that the method is feasible. Dependence on ram pressure to maintain flow through the absorber appears questionable and consideration should be given to other means. GRA

N75-24926# Pratt and Whitney Aircraft, West Palm Beach, Fla.
PROCESS EVALUATION OF DIRECTIONALLY SOLIDIFIED NI3CB REINFORCED EUTECTICS IN TURBINE BLADE FORM Final Report, 16 Mar. 1974 - 15 Mar. 1975
P. M. Curran, L. F. Schulmeister, J. S. Erickson, and A. F. Giamei 15 Mar. 1975 106 p refs
(Contract N00019-74-C-0194)

(AD-A008435; PWA-5231) Avail: NTIS CSCL 21/5

The purpose of the program was to investigate the unidirectional solidification of delta (Ni3Cb) reinforced eutectic alloys in turbine blade form. The liquid metal cooling (LMC) process, served as the basic processing technique for this investigation. The major objectives of the program were to: (1) evaluate solidification process modifications to increase the temperature gradient capability of the liquid metal cooling process, (2) investigate the effect of solidification conditions on the microstructure and mechanical behavior of delta (Ni3Cb) reinforced eutectic alloys solidified in turbine blade form, and (3) evaluate the solidification characteristics associated with the fabrication of (air-cooled) eutectic turbine blade airfoils. GRA

N75-24927# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

COMPARATIVE STUDY OF ISO AND J PROFILES

D. Godard, C. Seliquer, and M. Gottscheck 12 Mar. 1975 26 p Transl. into ENGLISH from Bur. de Normalisation de L'Aeron. et de L'Espace (France), no. 11, 1967 p 1-22

(AD-A007937; FTD-HC-23-0974-75) Avail: NTIS CSCL 11/6

A study program was conducted comparing the ISO/R 68 and J BNAe 05-230/MIL-S-8879. This program deals with the five materials most often used in the aerospace industry: namely, Alloy steel, titanium alloy, A-286 steel, Vascojet 1000, and maraging steel. GRA

N75-24928# California Univ., Los Angeles.

ACOUSTIC EMISSION BEHAVIOR OF ALUMINUM ALLOYS

Kanji Ono and H. Ucisik Feb. 1975 32 p refs

(Contract N00014-69-A0200-4031)

(AD-A008204; UCLA-ENG-7514) Avail: NTIS CSCL 11/6

Acoustic emission studies of five high strength aluminum alloys are reported. Threshold crossing counts, their dependence on the threshold level, and frequency spectra were measured during fracture toughness tests and correlated to stress intensity factor. In the T7 conditions, acoustic emission due to plastic zone expansion was initially detected followed by that due to slow crack growth. GRA

N75-24929# Bell Aerosystems Co., Buffalo, N.Y.

ANALYSIS OF THE LIQUID ROCKET TANKAGE Final Report

John Salvaggi, H. G. Kammerer, and E. J. King Apr. 1975 260 p refs

(Contract F04611-74-C-0007)

(AD-A008535; AFRPL-TR-74-82) Avail: NTIS CSCL 11/6

The objective of this program was the assessment of storage container compatibility with N2O4, and ClF5, for periods of time up to and including 6 years of pressurized exposure. Tankage materials were aluminum alloys 2021, 2014, 2024, 2219, 6061, 7039, X7007, and 5456, as well as Arde 301 stainless steel, A-286 and Inconel 718. Two types of N2O4 were evaluated for compatibility, namely oxygenated and unoxygenated. The evaluation of the storage containers revealed that the major source of degradation was external. The primary cause of corrosion was the dilute acid, high humidity storage area environment. Internal corrosion observed in a very limited number of containers was attributable to a lack of thorough rinsing after exposure. The majority of internal surfaces showed little or no degradation from either oxidizer. GRA

N75-24930# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STUDY OF THE PROTECTION OF THE TITANIUM BOLT ASSEMBLY

G. Sertour and M. Guerlet 20 Mar. 1975 50 p Transl. into ENGLISH "Emis Par le Serv. Technique Aeron., Section Materlaux 22" France, 22 Nov. 1973 p 1-41

(AD-A007945; FTD-HC-23-0975-75) Avail: NTIS CSCL 13/5

The finishing presently used on the T-A6V bolt assembly--anodic sulfuric oxidation, lubrication with molybdenum bisulfate, is inconvenient in certain respects; in particular, from the point of view of corrosion of the poles by galvanic couples and adhesion of paints and mastics on the screw heads. The tests consisted of comparing various possible methods of protection, encountered during tests defined according to various norms. Among the tested protective agents, MoS2, Cadmium and Aluminum, only the aluminum protection agent gave results which were satisfactory in all respects. GRA

N75-24931# RMI Co., Niles, Ohio. Research and Development Dept.

GRAIN REFINEMENT OF TITANIUM ALLOYS Final Technical Report, May 1973 - Jun. 1974

M. J. Buczek, G. S. Hall, S. R. Seagle, and H. B. Bomberger Nov. 1974 142 p refs

(Contract F33615-73-C-5106; AF Proj. 7351)

(AD-A008532; AFML-TR-74-255) Avail: NTIS CSCL 11/6

The objective of this program was to determine the optimum amounts of yttrium added either as the oxide or element for grain refinement to commercial Ti-6Al-4V and Ti-38-6-44 titanium alloys and establish the effects on subsequent mechanical behavior and sonic inspectability. The properties of cast 8-inch-diameter ingots as well as 3-inch bar processed from these ingots were evaluated at yttrium contents up to 0.1 percent. Nearly all the mechanical property data were obtained on alloys containing 0.03 percent yttrium. At this level, significant grain refinement was not observed in Ti-38-6-44 although improved sonic inspectability, higher transverse ductility and improved stress-corrosion resistance were observed. At the same 0.03 percent yttrium content, the recrystallized Ti-6Al-4V beta grain size was reduced and improved sonic inspectability and ductility were obtained in wrought and cast products. GRA

N75-24932# Naval Research Lab., Washington, D.C.

STANDARD METHOD OF TEST FOR PLANE-STRAIN STRESS-CORROSION-CRACKING RESISTANCE OF METALLIC MATERIALS Final Report

R. W. Judy, Jr. and R. J. Goode 17 Mar. 1975 11 p refs

(NRL Proj. M01-30; ZF54544002)

(AD-A008119; NRL-7865) Avail: NTIS CSCL 11/6

The long-term integrity of marine structures depends heavily on the inherent resistance of the structural material to the initiation and propagation of cracks in the seawater environment. In military structures, applied loads are very complex and the design models and laboratory verification experiments are correspondingly complex; however the utility of materials for many applications is decided by the simple characterization of the stress-corrosion-cracking sensitivity in terms of the linear-elastic threshold stress intensity K sub(I sub scc). Because this parameter is important in selecting materials and designing marine structures, it is necessary to formulate a standard method of test to insure uniformity of test results. This report is concerned with the cantilever method for determining K sub(I sub scc) for metallic materials. GRA

N75-24933# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

THE INFLUENCE OF LASER INDUCED OXIDATION ON THE ABSORPTIVITY OF TITANIUM M.S. Thesis

John R. Dreesman Apr. 1974 182 p refs

(AD-A008367; GAW/MC/74-5) Avail: NTIS CSCL 11/6

Polished commercially pure (CP) titanium and Ti-6Al-4V alloy specimens were oxidized isothermally in a laboratory furnace for varying lengths of time. The grown oxide films of known thickness, surface conditions and major composition, were then subjected, along with unoxidized samples, to 10.6 micrometer laser radiation in air. Thermal response of the samples was measured. Oxidation effects were inferred by comparison of resulting thermal response curves for the initially oxidized and unoxidized samples. Room temperature reflectivity measurements were also taken of each sample prior to laser tests. In addition, absorptivities were inferred by comparing experimental versus computer generated thermal response curves. Computer modeling of experimental response data was also performed. A literature survey is included. GRA

N75-24934# California Univ., Los Angeles. School of Engineering and Applied Science.

THE PHENOMENOLOGICAL EQUATIONS FOR MULTICOMPONENT DIFFUSION Interim Report

J. M. Sanchez and D. deFontaine Jan. 1975 66 p refs

(Grant NSF GH-32577)

(PB-239370/0; UCLA-ENG-7506) Avail: NTIS HC $4.25

The Onsager's reciprocal relations and the symmetry of the free energy matrix in the number fixed reference frame for multicomponent solid solutions are expressed as constraint equations on the elements of the free energy and mobility matrices which involve only the eigenvector directions of the diffusion matrix. The advantages of working in the number-fixed reference frame, where the free energy matrix is symmetric, are shown through a particular example: the ternary AgAuPd system, for which the free energy and mobility matrices are calculated from measured values of the diffusivities. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N75-24935*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DYNAMIC SEM WEAR STUDIES OF TUNGSTEN CARBIDE CERMETS
William A. Brainard and Donald H. Buckley 1975 35 p refs Presented at the Lubrication Conf., Miami Beach, Fla., 21-23 Oct. 1975, sponsored by the Am. Soc. of Lubrication Engr. and the Am. Soc. of Mech. Engr.
(NASA-TM-X-71659) Avail: NTIS HC $3.75 CSCL 11B

Dynamic friction and wear experiments were conducted in a scanning electron microscope. The wear behavior of pure tungsten carbide and composite with 6 and 15 weight percent cobalt binder was examined, and etching of the binder was done to selectively determine the role of the binder in the wear process. Dynamic experiments were conducted as the tungsten carbide (WC) and bonded WC cermet surfaces were transversed by a 50 micron radiused diamond stylus. These studies show that the predominant wear process in WC is fracture initiated by plastic deformation, and the wear of the etched cermets is similar to pure WC. The presence of the cobalt binder reduces both friction and wear. The cementing action of the cobalt reduces granular separation, and promotes a dense polished layer because of its low shear strength film-forming properties. The wear debris generated from unetched surface is approximately the same composition as the bulk. Author

N75-24936# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
FAILURE ENVELOPES OF PAINT FILMS AS RELATED TO PIGMENTATION AND SWELLING
U. Zorll 1975 20 p refs Transl. into ENGLISH from 11th FATIPEC Congr. (Florence), 11-16 Jun. 1972 p 401-407
(NRC-TT-1787) Avail: NTIS HC $3.25

A suitable presentation of the tensile properties of paint films was obtained by means of Smith's failure envelope. The viscoelastic states of material appear distinctly on the failure envelope, and technological properties, such as strength, toughness, and deformability, can also be evaluated. Films of linseed alkyd, pigmented with Pb3O4, MgO and ZnO, exhibited a shift to the energy-elastic state with increasing pigmentation. In the swollen state, this tendency is markedly reduced by swelling of the binder. The active effects of the pigments are diminished at higher pigment volume concentration, since reactive groups in the binder may then be lacking. For systems with inactive pigments, such as urea resin/Fe2O3 and PVC-copolymer/TiO2, failure envelopes in the dry and swollen state were found which indicate no essential change in the viscoelastic character of the films. Author

N75-24937*# IIT Research Inst., Chicago, Ill. Technology Center.
DEVELOPMENT OF SPACE STABLE THERMAL CONTROL COATINGS FOR USE ON LARGE SPACE VEHICLES Triannual Report, 1 Sep.-31 Dec. 1974
J. E. Gilligan and Y. Harada Feb. 1975 87 p refs
(Contract NAS8-26791)
(NASA-CR-143850; IITRI-C6233-48) Avail: NTIS HC $4.75 CSCL 11D

The development of a large scale manufacturing method for the production of a stable zinc orthotitanate pigment is studied, with emphasis placed on the comprehensive analysis of the properties and environmental stability of oxalate precursor zinc orthotitanate pigments and of the preparative conditions (time and temperature) leading to optimum properties and optical stability. Author

N75-24938*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PROCESS FOR PREPARING LOW DENSITY POLYBENZIMIDAZOLE FOAMS Patent Application
Demetrius A. Kourtides, John A. Parker, and Chadwick B. Delano, inventors (to NASA) (Whittaker Corp.) Filed 29 Apr. 1975 20 p
(NASA-Case-ARC-10823-1; US-Patent-Appl-SN-572784) Avail: NTIS HC $3.25 CSCL 11D

Low density polybenzimidazole foams are prepared by controlled thermal crosslinking of the polybenzimidazole prepolymers. The heating rate during the temperature range at which foaming occurs is regulated at 2 K per minute. The polymer is then heated to a maximum cure temperature of from about 740 K to 800 K in order to obtain optimal thermophysical properties. Polybenzimidazole foams prepared in this manner have reproducible densities of 24 Kg/cu m to 60 Kg/cu m. NASA

N75-24939*# Scientific Translation Service, Santa Barbara, Calif.
TECHNIQUE FOR DETERMINING THE MECHANICAL PROPERTIES OF FLEXIBLE COATINGS AND A BASIS FOR THE SELECTION OF THEIR DESIGN
V. V. Babenko Washington NASA 9 Jun. 1975 18 p refs Transl. into ENGLISH from Bionika (USSR), no. 7, 1973 p 71-79
(Contract NASw-2483)
(NASA-TT-F-16392) Avail: NTIS HC $3.25 CSCL 11D

A calibration technique is proposed for determining the relation between elasticity and tension in synthetic viscoelastic membranes. Specifications are listed for a number of flexible synthetic coatings. Similarity criteria are calculated for synthetic coatings of this type. Their hydrodynamic stability is also studied as a function of variables contained in the similarity criteria. Author

N75-24940*# Kentucky State Univ., Frankfort. Dept. of Chemistry.
SYNTHESIS OF ORGANOSILOXY: TRANSITION METAL POLYMERS Final Technical Report
Gerald A. Marano [1974] 46 p refs
(Grant NsG-8008)
(NASA-CR-142958) Avail: NTIS HC $3.75 CSCL 07C

The new compound, Mo(OSiPH3)4 (where Ph is C6H5) was synthesized. An overall chemical reaction which accounts for the observed products is given by the redox approach. Results indicate that Mo(OSiPH3)4 is thermally stable up to 230 C and relatively unreactive toward most common acids and bases even at elevated temperatures. Its behavior is not unlike that of Ti(OSiPH3)4. Author

N75-24941# Joint Publications Research Service, Arlington, Va.
COMPOSITION OF A DIAMOND ALLOY
R. A. Alikhanov, Ye. S. Chebotareva, S. G. Nuzhdina, and V. P. Modenov 11 Jun. 1975 10 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 220, no. 2, 1975 p 325-327
(JPRS-64968) Avail: NTIS HC $3.25

An investigation of a diamond composite material prepared by impregnating fine-crystalline diamond powder using a binder consisting of the alloy 55 weight percent Ti and 45 weight percent Cu is presented. Author

N75-24942# Royal Aircraft Establishment, Farnborough (England).
NONLINEAR CREEP IN GLASS-FABRIC REINFORCED PLASTICS SUBJECTED TO VARIOUS STATES OF COMPOUND STRESS
A. F. Kregers, R. D. Maksimov, and R. P. Turtsinsh Mar. 1975 15 p refs Transl. into ENGLISH from Mekhan. Polimerov, Akad. Nauk Latv. SSR (Riga), v. 2, 1973 p 212-218
(RAE-Lib-Trans-1824; BR47556) Avail: NTIS HC $3.25

Experiments were carried out on the creep of tubular specimens of glass-fabric reinforced plastics subjected to tension, compression, and torsion, and the combined action of such loadings. The intrinsic effect of the sign of the normal stress on the onset of shear creep was shown. The basic rheological parameters of the material were determined and approximated to the experimental curves, and a comparison was made between the calculated and experimental results. Author

N75-24943*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRICTION AND WEAR OF METALS IN CONTACT WITH PYROLYTIC GRAPHITE
Donald H. Buckley and William A. Brainard Washington Jun. 1975 25 p refs
(NASA-TN-D-7986; E-8195) Avail: NTIS HC $3.25 CSCL 11D

Sliding friction experiments were conducted with gold, iron, and tantalum single crystals sliding on prismatic and basal orientations of pyrolytic graphite in various environments, including vacuum, oxygen, water vapor, nitrogen, and hydrogen bromide. Surfaces were examined in the clean state and with various adsorbates present on the graphite surfaces. Auger and LEED spectroscopy, SEM, and EDXA were used to characterize the graphite surfaces. Results indicate that the prismatic and basal orientations do not contain nor do they chemisorb oxygen, water vapor, acetylene, or hydrogen bromide. All three metals exhibited higher friction on the prismatic than on the basal orientation and these metals transferred to the atomically clean prismatic orientation of pyrolytic graphite. No metal transfer to the graphite was observed in the presence of adsorbates at 760 torr. Ion bombardment of the graphite surface with nitrogen ions resulted in the adherence of nitrogen to the surface. Author

N75-24944# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
INFLUENCE OF RAINFALL INTENSITY ON EROSION OF MATERIALS AT SUPERSONIC VELOCITIES
George F. Schmitt, Jr. 14 May 1975 26 p refs Backup Document for AIAA Synoptic scheduled for publication in Journal of Aircraft in Nov. 1975
Avail: NTIS HC $3.75

Rain erosion tests were conducted on the Holloman rocket sled track rainfield at M = 4.0 on plastic composites, bulk plastics, monolithic ceramics, and reinforced ceramic composities. Erosion was measured at two rain intensity levels, which were possible as a result of reconstruction of the rainfield with a different spray nozzle arrangement. The results show that the influence of rain concentration is linear over a range from 3 to 8 g/cu m, that the erosion mass loss varies with the sine of the impingement angle, and that shock layer shielding reduces the mass loss (which can be accounted for using available theories of droplet breakup). Author

N75-24945# Rockwell International Corp., Anaheim, Calif. Autonetics Div.
INVESTIGATION OF ADVANCED PROTECTIVE AND ANTIREFLECTION COATINGS FOR HALIDE OPTICS Semiannual Report, 1 Jun. - 30 Nov. 1973
Bernard L. Weigand and Theodore J. LaChapelle, Jr. 19 Dec. 1973 17 p refs
(Contract F19628-73-C-0275; ARPA Order 2415)
(AD-A008034; C73-892.2/201; AFCRL-TR-74-0030) Avail: NTIS CSCL 20/6

The design and assembly of the radio frequency glow discharge and ultraviolet photolysis equipment for the polymerization of organic monomers on potassium chloride laser windows has been completed. The ultraviolet photolysis chamber has been modified to permit glow discharge cleaning of the potassium chloride prior to the polymeric deposition. Deposition by a combination of glow discharge and ultraviolet photolysis is also possible. Preliminary polymer depositions using the photolytic chamber were conducted. Chemical polishing studies were initiated using n-butyl and isopropyl alcohols and a Syntron Polisher, both with and without polishing powders. Surface removal rates of about 600 A/minute were established. GRA

N75-24946# Akron Univ., Ohio. Inst. of Polymer Science.
DEVELOPMENT OF HIGHLY ORIENTED POLYMERS WITH IMPROVED MECHANICAL PROPERTIES, PART 1 Annual Report, Apr. 1973 - Apr. 1974
Eberhard A. Meinecke and Donald McIntyre May 1974 74 p refs
(Contract F33615-73-C-5113)
(AD-A008195; AFML-TR-74-135-Pt-1) Avail: NTIS CSCL 11/9

The basic need for stronger polymeric films is discussed in the context of new theoretical and experimental evidence. It is shown that extended-chain crystals of polymers, that is, polymer chains which do not fold back on themselves should have high strength and stiffness. However, it is necessary to use these materials in the form of films that have all of the chains oriented in one direction. It is shown that such laminates should and do have enhanced mechanical properties. Experiments to produce such oriented films with polyethylene crystallized in a shear field are reported. A stirred, high-pressure crystallizer was designed and assembled, although no data have yet been obtained. Screening tests to evaluate a variety of materials were conducted with several polymers. Poly(n-alkyl isocyanates) were cast as ultra-thin films and show promise as a high regular extended-chain crystal. Preliminary x-ray diffraction studies of these materials were performed. GRA

N75-24947# Marvalaud, Inc., Westminster, Md.
THE MATERIAL PROPERTIES OF GELATIN GELS Final Report
J. Winter and D. Shifler Mar. 1975 157 p refs
(Contract DAAD05-73-C-0524; DA Proj. 1T7-62708-A-068)
(AD-A008396; BRL-CR-217) Avail: NTIS CSCL 11/7

A collection of physical and mechanical properties have been examined for 20% gelatin gels made from Pharmagel A. Among those parameters measured are density, thermal conductivity, specific heat, specific capacitance, ultrasonic wave velocity, and coefficient of rolling friction. The critical field strength above which electrical properties change radically is documented. An equivalent passive circuit model is proposed. Fracture stress and elastic moduli are measured. Shear stress at fracture and shear moduli are measured. Fracture strains are also documented for many strain rates. The gelatin is examined for piezo-electric effects and electro-optic effects which would modify its stress birefringence by application of an electric field. Surface polarization effects are also examined. The nature of the fracture surface as a function of crack propagation rate is characterized. A visco-elastic transition strain rate is also documented. Finally, changes of density with storage time at fixed temperature and humidity and changes of density with variations in composition are examined. GRA

N75-24948# Battelle Columbus Labs., Ohio.
AIRCRAFT PROPULSION LUBRICATING FILM ADDITIVES. VOLUME 2: BOUNDARY LUBRICANT SURFACE FILMS Phase Report, 1 Dec. 1973 - 30 Nov. 1974
C. M. Allen, E. Drauglis, W. A. Glaeser, C. A. Alexander, and R. J. Jakobsen Jan. 1975 51 p refs
(Contract F33615-73-C-2026; AF Proj. 3048)
(AD-A008530; AFAPL-TR-73-121-Vol-2) Avail: NTIS CSCL 11/8

The purpose of this investigation is the development of an adequate understanding of boundary lubricant films so as to permit the systematic design and formulation of new boundary lubricant-fluid systems. If a given fatty acid is added to a group of hydrocarbon solvents of various chain lengths, the boundary lubricating character is different, thereby suggesting strongly that the solvent is entering into the formation of a boundary lubricant film. Because much is known about straight-chain hydrocarbon solvents and fatty acid additives, these were selected for determining the validity of the proposed model. As the surface films of interest are considered to be liquid crystal-like, the use of polarized radiation was considered practicable. Actually, the technique selected is frustrated-multiple-internal-reflection (FMIR) spectroscopy. The results of the experimental research on molecular ordering of surface films and their thermal and mechanical properties are presented in the following sections. A resume of the theoretical research and analytical methodology is also presented. GRA

N75-24949# National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
A NEW MODE OF CHIPPING FRACTURE IN BRITTLE SOLIDS AND ITS APPLICATION IN A MODEL FOR WEAR UNDER FIXED ABRASIVE CONDITIONS. 1: MODE OF CHIPPING FRACTURE. 22: WEAR MODEL Interim Report, 1 Jul. 1974 - 30 Jun. 1975
Brian R. Lawn Feb. 1975 44 p refs
(Contract NAonr-4-75)
(AD-A008538; NBSIR-75-659) Avail: NTIS CSCL 11/2

A description is given of the mode of chipping fracture observed in highly brittle solids. It is pointed out that residual stresses about indentation deformation centers play a vital role. The implications of this mode in a number of mechanical phenomena are discussed. An explicit model for the wear of brittle surfaces under fixed abrasive conditions is presented in terms of indentation fracture concepts. The predicted wear rate for glass agrees with that observed experimentally to within an order of magnitude. Some implications concerning the parameters which influence the abrasion process, particularly the hardness, are discussed. GRA

N75-24950# Boeing Commercial Airplane Co., Seattle, Wash.
DURABILITY OF ADHESIVE BONDED JOINTS Interim Report, 1 Feb. - 1 May 1974
Art Marceau and Weldon Scardino Feb. 1975 56 p refs
(Contract F33615-74-C-5065; AF Proj. 7381)
(AD-A008529; AFML-TR-75-3) Avail: NTIS CSCL 13/5

The technical report is a complete survey of test methods in use or proposed by various investigators for determining the durability, under stress and adverse environments, of adhesive bonded joints and structures. Illustrations of the methods are given along with a discussion and analysis of each method. References for all methods are tabulated and a summary table is presented giving evaluation criteria and advantages and disadvantages of the various tests. GRA

N75-24951# Army Foreign Science and Technology Center, Charlottesville, Va.
NONMETALLIC MATERIALS
N. G. Chumak 4 Feb. 1974 18 p Transl. into ENGLISH from the monograph "Materialy i Tekhnologiya Mashinostroeniya" USSR, 1972 p 52-64
(AD-A008248; FSTC-HT-23-1553-73) Avail: NTIS CSCL 11/9

Nonmetallic materials have found wide application in all branches of industrial enterprise. The authors refer briefly to plastics, resins, ebonites, graphite, and abrasive materials, lacquers, coatings and cementing materials, leather, asbestos, glass, ceramics, porcelain, marble, felt, textiles, paper, lubricating and other materials. GRA

N75-24952# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PRODUCT NORMS SURFACE TREATMENT MATERIALS SYNTHETIC ENAMEL PAINT ALKYD ENAMEL PAINT
18 Mar. 1975 13 p Transl. into ENGLISH from the monograph "Forsvarets Materielverk" Stockholm, 9 Dec. 1963 p 1-5
(AD-A007940; FTD-HC-23-0993-75) Avail: NTIS CSCL 11/3

The chemical composition, quality, and characteristics of synthetic enamel paints are discussed. Properties discussed include weather resistance, resistance to liquids (water, gasoline, and oil), covering power, gloss, scratch resistance, temperature sensitivity, infrared reflectivity, and production characteristics. M.J.S.

N75-24953# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CONTEMPORARY TRENDS IN ELECTROCERAMICS
Kr. Simeonov 18 Mar. 1975 10 p refs Transl. into ENGLISH from Stroit. Materiali Silikat. Prom. (Sofia), no. 4, 1970 p 22-24
(AD-A007936; FTD-HC-23-0948-75) Avail: NTIS CSCL 11/2

The development of ceramic materials and their role in electric and electronic industries were examined. Topics discussed include electrical insulation, dielectrics and ferroelectrics, piezoelectric elements, microminiature circuits, semiconductor ceramic materials, thermoresistant and laser applications. M.J.S.

N75-24954# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
STRUCTURE-STABILITY RELATIONSHIPS OF POLYMERS BASED ON THERMOGRAVIMETRIC ANALYSIS DATA. PART 1: POLYALIPHATICS, POLYALICYCLICS, SPIROPOLYMERS AND PHENYLENE-R-POLYMERS Progress Report, 1961-1973
Gerhard F. L. Ehlers Dec. 1974 74 p refs
(AF Proj. 7340)
(AD-A008187; AFML-TR-74-177-Pt-1) Avail: NTIS CSCL 07/3

Thermogravimetric analysis data of about 500 aliphatic, alicyclic and aromatic (phenylene-R-) polymers, and numerous literature data, have been used to correlate polymer structure with thermal stability. The temperature of the extrapolated onset of the first major breakdown step has been used as criterion for thermal stability. The results, by polymer classes, are listed in the discussion section. The maximum stabilities obtained for various polymers and moieties, order of stabilities of linking groups, the effect of lengths of alkylene chains, tacticity, packing, branching, crosslinking, sidegroups and other factors have been discussed. GRA

N75-24955# Iowa State Univ. of Science and Technology, Ames. Engineering Research Inst.
PROPERTIES OF CERAMIC MATERIALS Final Report, 1 Sep. 1967 - 30 Sep. 1973
Thomas D. McGee Jan. 1975 17 p refs
(Contract F33615-68-C-1034; AF Proj. 7420)
(AD-A008534; ARL-TR-75-0003; ARL-75-0003) Avail: NTIS CSCL 11/2

Areas of research included: solid electrolytes; thermodynamics of electrochemical cells; kinetics of ionic transport; electrical conductivity of NaCl; creep of oxides at high temperatures; diffusion in oxides and fluorides--including refractory and rare earth compounds; high temperature strength and refractory and rare earth compounds; high temperature strength and recovery of oxide ceramic materials--including single crystal rutile and sapphire; stoichiometry and point defect concentrations in ultra pure $BaTiO_3$; theoretical analyses of acousto electric coupling, signal amplification (phonon amplification), insertion losses, and modes of vibration for surface waves of piezoelectric crystals; fiberglass water and fiberglass benzene adsorption isotherms with multiple internal reflection infrared analysis; and neutron activation analysis. GRA

N75-24956# Merchant Marine Academy, Kings Point, N.Y.
NEW APPLICATIONS OF NON-METALLIC MATERIALS ABOARD SHIP Final Report
Joseph B. Crisante Oct. 1974 109 p refs
(COM-75-10186/5; NMRC-KP-107) Avail: NTIS HC $5.25 CSCL 13J

Nonmetallic materials - laminated plastics, extrusions, moldings, structural plastics, single-skin, and sandwich structures and especially glass reinforced plastics are finding increasing use, and consideration for further use in the field of marine engineering. Examples are given of nonmetallic materials and items which were already fabricated and service tested. Areas for improvement and solutions for problems encountered in these items are proposed, as well as suggestions for new applications aboard ship. Properties and costs of plastics are discussed. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N75-24957*# Scientific Translation Service, Santa Barbara, Calif.
HYDROCARBON POWER FUEL FROM THE GASOLINE BOILING RANGE
G. W. Eckert, H. V. Hess, and E. C. Knowles Washington NASA Jun. 1975 26 p Transl. into ENGLISH from German patent

no. 1144971 (US Appl., 11 Oct., 23 Dec. 1957, 7 Mar., 10 Mar., 14 Apr., 19 Jun., 27 Jun. 1958)
(Contract NASw-2483)
(NASA-TT-F-16399) Avail: NTIS HC $3.75 CSCL 21D

Blends of catalytically cracked and reformed gasolines are discussed which have high octane numbers due to their high aromatic and olefinic content. The addition of a lead organic compound does not give as great an increase to the octane numbers for such a gasoline as for one which has high percentages of saturated paraffins. When a gasoline blend containing at least 10% aromatic and olefinic hydrocarbons is treated with 0.1-5.0 volume percent of saturated monocarboxylic acid, the Et4Pb-type compound markedly increases the octane number. The antiknock performance and characteristics of these gasolines are discussed in detail. Author

N75-24958# Royal Aircraft Establishment, Farnborough (England).
THE FATIGUE STRENGTH OF AN ALUMINIUM ALLOY IN PETROLEUM JET FUELS AT VARIOUS TEMPERATURES
A. V. Karlashov and I. I. Pryakhin Mar. 1975 10 p refs Transl. into ENGLISH from Fiz. Khim. Mekhan. Materialov, Akad. Nauk Ukr. SSR (Kiev), v. 10, no. 1, 1974 p 24-27
(RAE-Lib-Trans-1840; BR47456) Avail: NTIS HC $3.25

Corrosion fatigue of aluminum alloys in petroleum jet fuels was investigated. It was found that the fatigue strength of D16A-T aluminum alloy at 20 C is somewhat lower in petroleum fuels than in air. In addition, the fatigue strength of the alloy decreased with increase in fuel temperature. Author

N75-24959*# Alcorn State Univ., Lorman, Miss. Dept. of Biology.
BIODEGRADATION OF ROCKET PROPELLENT WASTE, AMMONIUM PERCHLORATE Final Report
Syed M. Z. Naqui 23 Jun. 1975 34 p refs
(Grant NsG-8005)
(NASA-CR-142965) Avail: NTIS HC $3.75 CSCL 21I

The impact of the biodegradation rate of ammonium perchlorate on the environment was studied in terms of growth, metabolic rate, and total biomass of selected animal and plant species. Brief methodology and detailed results are presented. Author

N75-24960*# MB Associates, San Ramon, Calif.
SBASI: ACTUATED PYROTECHNIC TIME DELAY INITIATOR Final Report
S. J. Salter, R. E. Lundberg, and G. L. McDougal Jun. 1975 79 p refs
(Contract NAS1-10988)
(NASA-CR-2537) Avail: NTIS HC $4.75 CSCL 19A

A precision pyrotechnic time delay initiator for missile staging was developed and tested. Incorporated in the assembly is a single bridgewire Apollo standard initiator (SBASI) for initiation, a through-bulkhead-initiator to provide isolation of the SBASI output from the delay, the pyrotechnic delay, and an output charge. An attempt was made to control both primary and secondary variables affecting functional performance of the delay initiator. Design and functional limit exploration was performed to establish tolerance levels on manufacturing and assembling operations. The test results demonstrate a 2% coefficient of variation at any one temperature and an overall 2.7% coefficient of variation throughout the temperature range of 30 to 120 F. Tests were conducted at simulated operational altitude from sea level to 200,000 feet. Author

N75-24961# Institut fuer Chemie der Treibstoffe, Berghausen (West Germany).
DETERMINATION OF THE 65.5 C DURABILITY OF PROPELLANT POWDERS BY ACCELERATED STORAGE AT HIGH TEMPERATURES [ERMITTLUNG DER 65,5 C-LEBENSDAUER VON TREIBLADUNGSPULVERN DURCH BESCHLEUNIGTE LAGERUNG BEI HOEHEREN TEMPERATUREN]
F. Volk 31 Dec. 1972 48 p refs In GERMAN
(ICT-11/72) Avail: NTIS HC $3.75

The life of four different propellant powders at 65.5 C was determined by extrapolation from results of high temperature storage tests. The result was compared with real data of storage at 65.5 C under the same conditions and with data of the surveillance test. At the same time the aging of stabilizers was investigated by means of their larger chromatography. ESRO

N75-24962# Institut fuer Chemie der Treibstoffe, Berghausen (West Germany).
ORGANIC COMPOUNDS RICH IN OXYGEN [SAUERSTOFFREICHE ORGANISCHE VERBINDUNGEN]
F. W. Wasmann 31 Dec. 1973 24 p refs In GERMAN
(ICT-6/73) Avail: NTIS HC $3.25

A number of compounds with high oxygen content were prepared by introducing nitro and nitrade groups in organic compounds, which are applicable as oxidizers for solid propellants. The manufacture and properties of these oxygen-containing organic compounds are described. None of the compounds prepared could be used as a substitute for the normal solid propellant oxidizers, as they were chemically unstable, sensitive to mechanical effects, or not compatible with propellant binders. ESRO

N75-24963# Institut fuer Chemie der Treibstoffe, Berghausen (West Germany).
INVESTIGATIONS ON THE DURABILITY OF ROCKET PROPELLING CHARGES Final Report [UNTERSUCHUNGEN UEBER DIE LEBENSDAUER VON RAKETENTREIBSAETZEN]
F. Volk, D. Schmitt, and G. Wunsch 25 Nov. 1974 47 p refs In GERMAN
(Contract T-0136-07400-03026)
(ICT-5/74) Avail: NTIS HC $3.75

The life of double base rocket propellants as affected by several parameters was investigated. Investigations were carried out on the effect of burning rate moderators and stabilizers on the life of double base solid propellants, the diffusion of plastification materials between these propellants and insulating materials, and the effect of environmental conditions on the mechanical properties of the propellants. ESRO

N75-24964# Bradford Computer and Systems, Inc., New York.
COMPARATIVE PERFORMANCE OF HIGH EFFICIENCY SHIP PROPULSION SYSTEMS FOR DESTROYER HULL TYPES, VOLUME 1 Final Report, Jun. - Dec. 1974
Alan J. Stewart 6 Dec. 1974 89 p
(Contract N00014-74-C-0398; ARPA Order 2805)
(AD-A007340) Avail: NTIS CSCL 13/10

A comparative study of fuel consumption for destroyer type propulsion systems is made. Gas turbines have been assumed as prime movers and twin screw propellers used in all variations. It is concluded that substantial fuel savings and improvements in range can be attained by providing power transfer between shafts via electrical alternators, by adding small (5,000 hp) cruise turbines to supplement the main propulsion turbine or by utilizing a superconductive electrical propulsion system. The use of cruise turbines and alternators shows promise for application to propulsion systems in the near future while superconductive propulsion shows the greatest promise for future systems where the ship is designed around the propulsion system. GRA

N75-24965# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EFFECT OF SOME ADDITIONS ON THE CRITICAL DIAMETER AND THE RATE OF COMBUSTION OF MIXTURES OF ALUMINUM WITH GELATINIZED WATER
A. V. Basilev, V. V. Gorbunov, and A. A. Shidlovskii 11 Mar. 1975 12 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Khim. i Khim. Tekhnol. (USSR), v. 13, no. 3, 1970 p 318-321
(AD-A007932; FTD-MT-24-0237-75) Avail: NTIS CSCL 21/2

It is known that the ignition and combustion of aluminum powder is substantially impeded by the presence of a strong high-melting oxide film on the surface of its particles. By disturbing the integrity of this film by means of any physical or chemical effects, it is possible to decrease its protective properties and, thus, contribute to the ignition and combustion of aluminum. One of the possible methods is the lowering of the melting point of the oxide film with the introduction of fluorides of the metals, which form with Al2O3 readily fusible complex compounds. The effect of fluorides of Li, Na, K and Al on the critical diameter and the rate of combustion of a mixture of aluminum powder with water was investigated in the present work. GRA

N75-24966# Sun Oil Co., Marcus Hook, Pa. Applied Research Dept.
PREPARATION OF GAS TURBINE ENGINE FUEL FROM SYNTHETIC CRUDE OIL DERIVED FROM COAL Final Report
F. S. Eisen 6 Feb. 1975 74 p refs
(Contract N00014-74-C-0568)
(AD-A007923) Avail: NTIS CSCL 07/1

A 232 gallon gas turbine fuel sample containing 23 vol.% aromatics (20-25 vol.% specification target) was prepared from synthetic crude oil (syncrude) derived from Western Kentucky coal. The seven fuel specifications designated as most important were all met with the exception of smoke point. The following major processing steps were used to prepare the sample: Initial distillations (atmospheric distillation of the syncrude to remove light hydrocarbons and water, and vacuum distillation to remove the material boiling above about 500F); Hydrogenation of the resulting kerosene fraction to produce a 20-25 vol.% aromatics product; Final atmospheric distillation to remove light ends and produce a 140 to 155F flash point product. GRA

N75-24967# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
INVESTIGATION OF ASTM D 2887 TEST METHOD FOR USE WITH AIRCRAFT TURBINE ENGINE FUELS Summary Report, Mar. - Nov. 1974
Charles R. Martel Mar. 1975 105 p refs
(AF Proj. 3048)
(AD-A008185; AFAPL-TR-74-122) Avail: NTIS CSCL 14/2

Equations for estimating the results of ASTM D 86, Test for Distillation of Petroleum Products, from measurements of ASTM D 2887, Test for Boiling Range Distribution of Petroleum Fractions by Gas Chromatography, are presented. The equations have generated using a step-wise regression analysis method to obtain the greatest reduction in the error sum of squares. Equations are presented for wide-cut fuels only (JP-4 and Jet B), kerosene type fuels (JP-5, Jet A, and Jet A-1), and for both wide-cut and kerosene fuels together. An attempt was also made to calculate selected bulk fuel properties using D 2887 test data and other measured fuel properties. The API gravity, volume percent aromatics, freezing point, and either Reid vapor pressure or flash point were examined. GRA

N75-24968# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
TRENDS IN PROPERTIES OF UNLEADED GASOLINES Interim Report
J. N. Bowden Mar. 1975 37 p refs
(Contract DAAK02-75-C-0082)
(AD-A008407; AFLRL-57) Avail: NTIS CSCL 21/4

During the years 1973 and 1974, 72 samples of unleaded gasoline were obtained from refineries and service stations representing a broad spectrum of petroleum companies and locations across the continental United States. These samples were analyzed for properties normally associated with gasoline specifications and for more detailed hydrocarbon composition. Compared to average properties of conventionally leaded regular grade gasolines, the average unleaded fuels were found to contain higher concentrations of aromatic hydrocarbons equivalent olefin content and lower octane values. Compared to 1971 and 1972 unleaded fuels, these products showed little variation in hydrocarbon type composition, and sulfur content; however, lead content, even as a contaminant, was found to be at minimum levels while organo-phosphorus additives were not present in samples analyzed in 1974. GRA

N75-24969# Naval Ordnance Lab., White Oak, Md.
SENSITIVITY OF EXPLOSIVES TO TRANSITION FROM DEFLAGRATION TO DETONATION Progress Report, Feb. 1973 - Feb. 1975
Richard R. Bernecker and Donna Price 7 Feb. 1975 103 p refs
(SF33354314)
(AD-A008142; NOLTR-74-186) Avail: NTIS CSCL 19/1

A technique, called the auxiliary gas loading technique, has been developed to enable relatively insensitive explosives, such as TNT and Explosive D, to undergo a transition from deflagration to detonation (DDT) in our experimental arrangement. This technique uses variable but small amounts of a rapid burning, non-detonating explosive located between the ignitor and the test explosive. It has been shown that for a fixed density and type of gas loader and for a fixed density of a test explosive, there is a critical length of gas loader below which a transition will not occur and above which a transition will always occur. RDX and 94/6 RDX/wax have been studied as gas loaders. GRA

N75-24970# Army Foreign Science and Technology Center, Charlottesville, Va.
A METHOD OF DETERMINING INFLAMMABILITY OF EXPLOSIVES
B. N. Kondrikov, G. D. Kozak, and V. P. Lushkin 20 Sep. 1974 20 p refs Transl. into ENGLISH from Vzryvnoe delo (USSR), v. 68, no. 25, 1970 p 139-149
(AD-A008341; FSTC-HT-23-0858-74) Avail: NTIS CSCL 21/2

The article deals with various thermodynamic parameters during combustion of igniters, pyroxline and ammonium nitrate, used in small manometric and calorimeter bombs. Parameters for heat, pressure, condensation and water evaporation resulting from combustion are presented in theoretical and experimental form. The critical amounts of igniter and use of different explosive mixtures are discussed. GRA

N75-24971# Aerojet Solid Propulsion Co., Sacramento, Calif. Applied Mechanics and Dynamic Analysis Group.
ASYMMETRIC GRAIN EVALUATION COMPUTER PROGRAM USER'S MANUAL
Gene O. Chan and Niel R. Cull Jul. 1974 69 p
(Contract DAAH01-74-C-0434)
(AD-A008312; RK-CR-75-15) Avail: NTIS CSCL 21/2

The computer program described herein is the solution of the burning sequence for any generalized two-dimensional solid propellant grain cross section, defined as a singly performated, internally burning but otherwise arbitrary contour. Both the internal grain configuration and burning rate field may be specified at discrete locations throughout the two-dimensional field. The burning rate fields are specified in tabular form and are directly relatable to a burn time. The geometry of the motor case may be circular, elliptical, or any arbitrary configuration defined by a set of coordinate points. All boundaries, interfaces, etc., are described as the sum of straight-line segments connecting adjacent coordinate points. The numerical treatment of adjacent cross sections to determine burning area and subsequent ballistics is not within the scope of this program. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N75-24972# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
SIZE EFFECTS IN SUPERFLUID HELIUM. 2: INVESTIGATION BY A FUNCTIONAL METHOD
K. Maki and E. Guyon 1975 16 p refs Transl. into ENGLISH from j. de Phys., 30 (France), v. 1, 1969 p 63-70
(NRC-TT-1797) Avail: NTIS HC $3.25

A model of the critical behavior of the superfluid phase of helium consistent with the general idea of the phase transition of Landau is presented. The model explains the logarithmic singularity of the bulk helium at the lambda point. The fluctuations of the order parameter play a dominant role in the properties of the system. This model makes it possible to calculate the superfluid density in good agreement with experimental results. A simple assumption on the geometrical configuration is made and the critical properties of helium due to size effects (shift in the transition temperature and specific heat, and superfluid density) are discussed. Author

N75-24973# Joint Publications Research Service, Arlington, Va.
SIGNAL SELECTION AND TRANSMISSION
21 May 1975 42 p refs Transl. into ENGLISH from Otbor i Peredacha Informatsii (Kiev), no. 22, 1969, no. 23, 24, 25, 1970 25 p
(JPRS-64817) Avail: NTIS HC $3.75

Signal transmission and reflection in hydroacoustic media are studied. For individual titles, see N75-24974 through N75-24978.

N75-24974 Joint Publications Research Service, Arlington, Va.
REFLECTION OF A PLANE SOUND WAVE FROM A THIN ELASTIC INFINITE PLATE IN A FLUID **c71**
I. I. Gnatovskiy *In its* Signal Selection and Transmission (JPRS-64817) 21 May 1975 p 1-7 refs Transl. into ENGLISH from Otbor i Peredacha Informatsii (Kiev), no. 22, 1969 p 61-66 (For availability see N75-24973 16-31)

Two cases of the reflection of an acoustic wave from a thin elastic infinite plate are examined: (1) a fluid with density p is present on both sides of the plate; and (2) a fluid with density p is on one side of the plate and a vacuum is on the other. A plane acoustic wave propagates from left to right in the fluid. In the first case it is required to find the wave that is reflected by the plate and the one that passes through the plate, and in the second case the reflected wave. Author

N75-24975 Joint Publications Research Service, Arlington, Va.
HYDROACOUSTIC VIBRATION TRANSMITTER **c35**
S. M. Kidun, M. I. Gavriliv, V. M. Sardyga, and A. M. Agizim *In its* Signal Selection and Transmission (JPRS-64817) 21 May 1975 p 8-20 refs Transl. into ENGLISH from Otbor i Peredacha Informatsii (Kiev), no. 22, 1969 p 66-68 (For availability see N75-24973 16-31)

In certain cases it becomes necessary to measure the vibrations of systems or objects in water. Such measurements can be accomplished with a special hydroacoustic telemetry apparatus, consisting of transmitters with vibration tranducers and receivers. A schematic diagram of a transmitter, consisting of a piezoelectric vibration transducer, dual emitter repeater, modulator, master oscillator, preamp and power amplifier, operating on a piezoelectric radiator, is reported. Author

N75-24976 Joint Publications Research Service, Arlington, Va.
THE ERROR IN DETERMINING THE VELOCITY VECTOR OF MOVING OBJECTS IN TWO-POINT DIRECTION FINDING BY THE DOPPLER EFFECT **c70**
Ya. Ye. Belenkiy, V. K. Yeremenko, and Yu. I. Spektor *In its* Signal Selection and Transmission (JPRS-64817) 21 May 1975 p 21-27 refs Transl. into ENGLISH from Otbor i Peredacha Informatsii (Kiev), no. 24, 1970 p 130-135 (For availability see N75-24973 16-31)

The effect of the change of frequency of oscillations, determined by the motion of an object, carrying the source of oscillations, relative to the point of reception (the Doppler effect) is used extensively to determine the velocity vector of moving objects. The velocity vector can be determined by processing the Doppler correction obtained by two observation points at distance from each other. Author

N75-24977 Joint Publications Research Service, Arlington, Va.
CHOICE OF A CIRCUIT OF LOW-FREQUENCY THIRD-OCTAVE BAND-PASS FILTERS IN CONSIDERATION OF THEIR TRANSIENT TIME **c33**
A. M. Ler and M. N. Pedanich *In its* Signal Selection and Transmission (JPRS-64817) 21 May 1975 p 28-33 refs Transl. into ENGLISH from Otbor i Peredacha Informatsii (Kiev), no. 25, 1970 p 109-113 (For availability see N75-24973 16-31)

Two methods of the design and calculation of third octave band pass filters are examined. The first method consists in the formation of a third octave band from narrower bands. This method consists in the formation of a third octave band from three consecutive broadbands. A symmetric band pass filter consisting of resonance RC-circuits, based on the latter method is discussed. Author

N75-24978 Joint Publications Research Service, Arlington, Va.
THE EFFECT OF THE WATER-AIR INTERFACE ON THE TRANSMISSION OF AM AND FM SIGNALS **c32**
Ya. Ye. Belenkiy *In its* Signal Selection and Transmission (JPRS-64817) 21 May 1975 p 34-39 refs Transl. into ENGLISH from Otbor i Peredacha Informatsii (Kiev), no. 25, 1970 p 122-126 (For availability see N75-24973 16-31)

The communication channel introduces significant distortions during the transmission of measurement data through hydroacoustic channels by means of amplitude- and frequency-modulation. The dispersion properties of the medium are very weak during the transmission through water of a modulated signal in the acoustic band, but when the information source is lowered to a shallow depth in comparison with the depth of the water body reflection from the air-water interface begins to play a significant role. The effect of this boundary in the far acoustic field of a point source, located near the interface, is examined. Author

N75-24979# Sandia Labs., Albuquerque, N.Mex.
SHOCK SPECTRA
R. Rodeman Oct. 1974 28 p refs
(Contract AT(29-1)-789)
(SAND-74-0392) Avail: NTIS HC $3.75

The uses and properties of the shock spectrum of an excitation are presented. Included among the important uses are the establishment of upper and lower bounds on the peak response of linearly modeled multi-degrees-of-freedom systems from the shock spectrum of the excitation, and the selection of test excitations to simulate complex field environments. Two of the properties of the shock spectrum that are developed are the relationship between the Fourier transform of the excitation and the shock spectrum, and an energy bound on the excitation directly from the shock spectrum. A discussion is given of two computer programs, that were written to compute shock spectra. A numerical example that shows the validity of the various bounds that are obtainable from the shock spectra is also presented. Author (NSA)

N75-24980# Naval Surface Weapons Center, White Oak, Md.
THE LOW TEMPERATURE THERMOELECTRIC COOLER FOR NAVY USE Interim Report
James F. Goff 3 Feb. 1975 9 p refs
(ZR0110201)
(AD-A008145; NSWC/WOL/TR-75-17) Avail: NTIS CSCL 13/1

The present feasibility of a thermoelectric cooler for infrared devices that would attain a low temperature of about 100 K is discussed. Maximum allowed input power was 5000 watts. Limitations that result from present thermoelectric materials are quantified. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N75-24981* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MODULATOR FOR TONE AND BINARY SIGNALS Patent
James R. McChesney (Bell Aerospace Co., Buffalo), Theodore Lerner (Bell Aerospace Co., Buffalo), and Ernest J. Fitch, inventors (to NASA) (Bell Aerospace Co., Buffalo) Issued 15 Apr. 1975 8 p Filed 15 Jun. 1973 Supersedes N73-27107 (11 - 18, p 2116) Sponsored by NASA
(NASA-Case-GSC-11743-1; US-Patent-3,878,464; US-Patent-Appl-SN-370271; US-Patent-Class-325-30; US-Patent-Class-178-66R; US-Patent-Class-325-60) Avail: US Patent Office CSCL 09C

Tones and binary information are transmitted as phase variations on a carrier wave of constant amplitude and frequency. The carrier and tones are applied to a balanced modulator for deriving an output signal including a pair of sidebands relative to the carrier. The carrier is phase modulated by a digital signal so that it is + or - 90 deg out of phase with the predetermined phase of the carrier. The carrier is combined in an algebraic summing device with the phase modulated signal and the balanced modulator output signal. The output of the algebraic summing device is hard limited to derive a constant amplitude and frequency signal having very narrow bandwidth requirements. At a receiver, the tones and binary data are detected with a phase locked loop having a voltage controlled oscillator driving a pair of orthogonal detection channels.

Official Gazette of the U.S. Patent Office

N75-24982* National Aeronautics and Space Administration. Pasadena Office, Calif.
SYSTEM FOR INTERFERENCE SIGNAL NULLING BY POLARIZATION ADJUSTMENT Patent
John E. Ohlson (JPL) and William F. Williams, inventors (to NASA) (JPL) Issued 13 May 1975 8 p Filed 28 Jun. 1973 Supersedes N73-27106 (11 - 18, p 2116) Sponsored by NASA
(NASA-Case-NPO-13140-1; US-Patent-3,883,872; US-Patent-Appl-SN-374422; US-Patent-Class-343-100PE; US-Patent-Class-343-5GC) Avail: US Patent Office CSCL 17B

A receiving system for automatically selecting a desired one of two approximately orthogonally polarized signals occupying the same bandwidth, is described. Received signals are provided by any orthomode antenna system at a pair of output ports, i.e., right hand and left hand circular polarizations or two linear polarizations. The received signals are then applied to the inputs of a hybrid junction to produce sum and difference signals. The resulting sum signal at one output port comprises components of the undesired one of two orthogonally polarized signals and is used to coherently detect and dynamically balance out the undesired signal components that are included at the difference signal port. The desired one of two orthogonally polarized signals is thereby provided at the difference port of the hybrid junction. Feedback loops are used to effect dynamic balancing.

Official Gazette of the U.S. Patent Office

N75-24983 British Broadcasting Corp., Kingswood (England). Research Dept.
A POSSIBLE METHOD OF RECORDING AND REPLAYING VIDEO WITH SOUND-IN-SYNCS ON VIDEO TAPE RECORDERS
A. Roberts May 1975 4 p refs
(BBC-RD-1975/15) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

A method of recording and replaying a video signal with sound-in-syncs was proposed and experimental equipment was constructed to investigate the proposed method, with encouraging results. Tests show the method to be feasible, but more work in error-detection and error-correction would be required before a practical system could be constructed for general use. It is likely that, with such protection, a separate high quality sound channel could be accommodated on video tape recorders without detriment to the video signal. Author

N75-24984* + Environmental Research Inst. of Michigan, Ann Arbor. Radar and Optics Div.
BIBLIOGRAPHY OF IMAGING RADAR SYSTEMS DESIGN AND IMAGING RADAR DATA PROCESSING
Gary F. Adams and Ralph E. Hamilton [1975] 144 p refs Prepared for JPL
(Contract NAS7-100)
(NASA-CR-141848; TR-110200-2-F) Avail: NTIS HC $5.75 CSCL 17I

A bibliography on the development, design, and operation of side looking airborne radar systems is presented. E.H.W.

N75-24985* + Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
APPLICATIONS OF IMAGING RADAR: A BIBLIOGRAPHY Interim Report
Louis F. Dellwig, Norman E. Hardy, Richard K. Moore, Surendra K. Parashar, and Mary Alice Soule Sep. 1974 244 p refs Prepared for JPL
(Contract NAS7-100)
(NASA-CR-141849; RSL-TR-265-2) Avail: NTIS HC $7.50 CSCL 17I

A bibliography is presented which gives an annotated listing of the reports and papers produced in the first decade of earth-resource imaging radar study (plus a few earlier works) and summarizes the current state of knowledge as represented by publications. An extensive cross-reference index was provided to facilitate the identification of all entries even in small part pertinent to any discipline or aspect of investigation. Identification is made of the affiliation of the authors at the time of their research and, when available, at the present time (1974). In each case where a particular radar was used at a particular place and time, these items were identified. Author

N75-24986*# American Electronic Labs., Inc., Colmar, Pa.
NIMBUS TRACKING AND DATA RELAY EXPERIMENT RECEIVERS Final Report, 2 Jan. 1973 - 10 Dec. 1974
10 Dec. 1974 128 p
(Contract NAS5-21902)
(NASA-CR-143805) Avail: NTIS HC $5.75 CSCL 17B

Efforts made to improve the design of tracking data relay experiment receivers are summarized. All changes made and the resulting effect on the receiver are noted. Author

N75-24987# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE, SCIENTIFIC AFFAIRS, NO. 468
16 Jun. 1975 34 p refs Transl. into ENGLISH from East European journals
(JPRS-65015) Avail: NTIS HC $3.75

The development of and progress in the various theoretical and applied scientific disciplines and technical fields is discussed. The administration, structure, personnel, and research plans of leading East European scientific organizations and institutions are described. Topics include the following: application of lasers for metal cutting in Bulgaria; Baltic geophysical research; brucellosis incidence in Albania; digital transmission of pulse code modulation signals by microwave relays; and, mathematics research in East Germany. Author

N75-24988# Pisa Univ. (Italy).
ENERGY MINIMIZATION OF M-ARY ORTHOGONAL SIGNALS IN COMMUNICATION WITH FEEDBACK
Mario Mancianti, Franco Russo, and Lucio Verrazzani Mar. 1974 8 p refs Repr. from the IEEE Transactions on Aerospace and Electron. Systems, v. AES-10, no. 2, Mar. 1974 p 204-210
(Rept-1535) Avail: NTIS HC $3.25

A communication system with a feedback channel which makes use of orthogonal M-ary signals is considered. The problem of its optimization, by setting a maximum time to decide, is analyzed so that the average energy per bit required to obtain a pre-fixed probability of error results as a minimum. The results, shown on graphs, allow one to evaluate the maximum decision time and, afterwards, the maximum transmission rate. Author

N75-24989# Joint Publications Research Service, Arlington, Va.
OPTIMIZATION OF THE ELEMENTS OF SUPERHIGH FREQUENCY RANGE ANTENNA FEEDER DEVICES
A. L. Aginskiy 18 May 1975 7 p refs Transl. into ENGLISH from Izv. Vuzov SSSR-Radioelektron. (Kiev), v. 18, no. 2, 1973 p 3-7
(JPRS-64786) Avail: NTIS HC $3.25

Methods are considered for the optimal design of long feeder channels, and the selection of tolerances for making helical antennas. It was shown that as a result of optimization made by quantitative evaluations, it is possible to achieve a considerable gain for given efficiency indicators. Author

N75-24990*# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
SELECTED TIME DELAY DATA, PHASE 3 Final Report, 6 Dec. 1974 - 21 May 1975
J. R. Walsh and R. D. Wetherington 21 May 1975 84 p refs
(Contract NAS8-30919)
(NASA-CR-143860) Avail: NTIS HC $4.75 CSCL 17B

The results of a study on time delays in communication systems applicable to the teleoperator program are presented. Time delay data for 11 specific orbits of interest are shown.

These data can be used in the MSFC teleoperator simulator to investigate the effect of time delays in the communications link on the teleoperator control functions. Author

N75-24991# General Dynamics Corp., San Diego, Calif. Electronics Div.
DIGITAL PROCESSING RECEIVER Final Technical Report
B. E. Bjerede, G. Bartlow, T. Bartley, K. Clayton, and G. Fisher Feb. 1975 162 p
(Contract F30602-73-C-0226)
(AD-A008522; RADC-TR-75-44) Avail: NTIS CSCL 17/2

The study effort investigated cost-effective designs for a single - and multi-channel HF digital processing receiver. The basic design was also applied to an extended frequency range of 30-500 MHz. The conceptual design of the communication receiver has at the heart of the receiver a special purpose, high-speed micro programmed computer that uses emitter coupled logic circuits. The low-speed processing junctions, such as AGC, frequency control, mode of operation, bandwidth and input/output, is accomplished by an INTEL 8080 micro processor which also has a limited capability for signal selection. Computer simulations of two multichannel candidate system revealed that both systems could meet all critical performance requirements. Based on hardware considerations, a system using regular bandpass sampling and a recursive processor inplementation was selected as the most cost-effective approach. GRA

N75-24992# AEL Service Corp., Farmingdale, N.J.
RADIO FREQUENCY INTERFERENCE (RFI)/ELECTROMAGNETIC INTERFERENCE (EMI) MEASUREMENTS AIR ROUTE TRAFFIC CONTROL CENTERS Final Report, Aug. 1972 - Jul. 1973
Margaretta V. Stone Apr. 1975 380 p refs
(Contract DOT-FA72NA-728)
(AD-A008439; FAA-NA-74-174; FAA-RD-75-30) Avail: NTIS HC $10.25 CSCL 17/2

Electromagnetic interference tests conducted at three air route traffic control centers are described. The tests included measurement of radiated and conducted emission from both the automated system and nonautomated equipments, and radiated and conducted susceptibility of the automated system. Conducted and radiated emission from most of the automated system equipments exceeded the established limits, but was not sufficiently high to adversely affect other equipment. It was concluded that the automated system equipment would probably not affect the performance of other equipment used in its vicinity, provided that the other equipment met the susceptibility requirements or equivalent specifications. It was further concluded that the automated system is unlikely to be affected by electromagnetic interference generated within a typical air route traffic control site. It was recommended that revised emission and susceptibility limits be developed to reflect the specific requirements of the sites. Author

N75-24993*# Linguistic Systems, Inc., Cambridge, Mass.
STATISTICAL PROPERTIES OF SIGNALS REFLECTED FROM THE IONOSPHERE
I. S. Vsekhsvyatskaya Washington NASA Dec. 1974 166 p refs Transl. into ENGLISH of the book "Statisticheskiye svoystva signalov, otrazhennykh ot ionosfery" Moscow, Nauka Publ. House, 1973 p 1-135
(Contract NASw-2482)
(NASA-TT-F-15751) Avail: NTIS HC $6.25 CSCL 17B

Models of radiophysical processes formulated on the basis of the normal law, and of processes whose properties involve significant departures from the normal law (in particular pulsed noises) are compared. Models of processes formulated on the basis of the Poisson distribution are subjected to detailed analysis. Other topics discussed include various representations of probability density functions of random processes, the relationship between the statistical characteristics of instantaneous values and the envelope of compound signals, using the perturbation method to solve wave reflection problems from a statistically inhomogeneous drifting medium, and radio waves reflected from the ionosphere. Author

N75-24994*# Texas A&M Univ., College Station. Remote Sensing Center.
SUPPORT OF IMAGING RADAR FOR THE SHUTTLE SYSTEM AND SUBSYSTEM DEFINITION STUDY, PHASE 2 Progress Report
16 Oct. 1974 126 p refs Prepared for JPL
(Contract JPL-953929)
(NASA-CR-141850; PR-3090-2) Avail: NTIS HC $5.75 CSCL 17I

An orbital microwave imaging radar system suggested for use in conjunction with the space shuttle is presented. Several applications of the system are described, including agriculture, meteorology, terrain analysis, various types of mapping, petroleum and mineral exploration, oil spill detection and sea and lake ice monitoring. The design criteria, which are based on the requirements of the above applications, are discussed. D.M.L.

N75-24995# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF LONG WAVES ON ENERGY SPECTRA OF RADIO SIGNALS SCATTERED BY THE SEA SURFACE
I. A. Leykin, I. Ye. Ostrovskiy, A. D. Rozenberg, V. G. Ruskevich, and I. M. Fuks 6 Jun. 1974 17 p refs Transl. into ENGLISH from Izv. vuz Radiofizika (Gorkiy), no. 3, 1975 p 346-357
(JPRS-64930) Avail: NTIS HC $3.25

A fine structure of radar signals scattered by the sea surface at small slip angles is investigated. A model is suggested for the scattering surface which permits an explanation of the observed frequency shifts of radio signals of different polarizations in the framework of the resonance scattering theory. Author

N75-24996*# Goodyear Aerospace Corp., Litchfield Park, Ariz.
STUDY OF SYNTHETIC APERTURE RADAR (SAR) IMAGERY CHARACTERISTICS Final Report
30 May 1975 83 p
(Contract NAS6-2571)
(NASA-CR-141398; GERA-2089) Avail: NTIS HC $4.75 CSCL 17I

Sources of geometric and radiometric fidelity errors in AN/APQ-102A radar imagery are discussed, along with a digital computer program to correct the distortions. The major effort, a computer program which will process digitalized recorded AN/APQ-102A phase histories into imagery, is described. All computer programs are listed. Author

N75-24997# Sandia Labs., Albuquerque, N.Mex.
MONOPULSE-RADAR POINTING ERROR DUE TO MULTIPATH PROPAGATION OVER A ROUGH TERRAIN
T. S. Edrington and E. A. Aronson Dec. 1974 29 p refs
(Contract AT (29-1)-789)
(SAND-74-0409) Avail: NTIS HC $3.75

Analyses of radar pointing error due to multipath effects usually employ specular terrain models. Since terrain is generally nonspecular at radar frequencies, the specular results can be misleading. A rough terrain model is used and the dependence of pointing error on several antenna, terrain, and geometric parameters (which do not occur in the specular case), is used. A few specular results are given for comparison. Author (NSA)

N75-24998# Calspan Corp., Buffalo, N.Y.
ABSORPTION OF ELECTROMAGNETIC WAVES NEAR THE CRITICAL DENSITY Final Report, 1 Dec. 1973 - 30 Nov. 1974
J. W. Daiber, R. G. Rehm, and H. M. Thompson 30 Nov. 1974 8 p refs
(Contract AT(11-1)2288)
(COO-2288-8) Avail: NTIS HC $3.25

The program is an experimental study of the interaction of high-intensity ruby-laser radiation with gas in a free jet. In these experiments, both laser intensity and the plasma frequency can be varied. By monitoring several parameters, including incident and reflected power, X-ray emission and the kinematics of plasma growth, the existence of an anomalous threshold for coupling radiation into plasma energy should be determinable. Measurements in hydrogen show that between one and two percent of the incident laser radiation was reflected when X-rays were detected and only when X-rays were detected. Within the resolution of the instrumentation, there was no reflected radiation when nitrogen was used as a target gas. An abrupt change in reflectivity as a function of laser power and of reservoir pressure was not found. Author (NSA)

N75-24999# Arcon Corp., Wakefield, Mass.
DEVELOPMENT OF MATHEMATICAL MODELS AND STATISTICAL ANALYSIS TECHNIQUES AS APPLIED TO THE DIGITAL PROCESSING OF SIGNALS AND THE DESCRIPTION OF OTHER PHYSICAL SYSTEMS
Stanley Woolf, John V. OBrien, Edward Cohen, Jean Hsiung, and Elihu J. Tichovolsky 28 Feb. 1975 281 p refs
(Contract F19628-74-C-0049)
(AD-A008194; AFCRL-TR-74-0614; SR-1) Avail: NTIS CSCL 09/2

Contents: Interactive simulation of a dynamic radar environment; Low energy electron transport Boltzmann equation treatment; Low energy electron transport - Monte Carlo treatment; High energy electron transport; Fourier spectroscopy; Reflection from an idealized atmospheric wave; Sound propagation in piezoelectric crystals - the relationship between energy velocity and group velocity; TDY-52B Microprocessor assembler. GRA

N75-25000# Mitre Corp., Bedford, Mass.
AN ANALYTICAL EXAMINATION OF IMPEDANCE AND SIGNAL POWER LEVELS ALONG A MULTIPLEX DATA BUS
B. Mahler Mar. 1975 36 p refs
(Contract F19628-75-C-0001; AF Proj. 6370)
(AD-A008498; MTR-2928; ESD-TR-75-52) Avail: NTIS CSCL 17/2

Using MIL-STD-1553 (USAF) as a guide in defining a Multiplex Data Bus, this paper presents in graphical form the results of a series of calculations to determine bus impedance, stub impedance, and signal power levels along a Multiplex Data Bus. The paper also discusses the significance of these parameters in MUX Bus operation. GRA

N75-25001# Mitre Corp., Bedford, Mass.
THE DEVELOPMENT OF SURFACE WAVE DISPERSIVE FILTERS FOR USE IN A MULTICHANNEL PULSE COMPRESSION SYSTEM
W. M. Bridge Feb. 1975 64 p refs
(Contract F19628-73-C-0001; AF Proj. 7060)
(AD-A008499; MTR-2921; ESD-TR-74-366) Avail: NTIS CSCL 17/2

The technology and understanding of acoustic surface wave devices has progressed to the point where they can be used to implement sophisticated processing schemes such as a parallel channel pulse compression filter. The report discusses the design, development and experimental verification of the surface wave dispersive networks necessary to build a 7-channel pulse compression filter with 700 MHz bandwidth and a TW product of 4900. These individual channel filters must be time contiguous with identical linear FM dispersive characteristics. A division synthesis technique is developed for the realization of these filters. The technique is specifically tailored for an acoustic surface wave implementation consisting of one apodized and one unapodized transducer. The resulting filters were quite reproducible and their general characteristics (spectrum shape, bandwidth, and dispersive delay) were essentially as desired. GRA

N75-25002# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
ENGINEERING DESIGN OF THE TELEVISION INSTRUMENTATION SYSTEM FOR THE HARPOON CAPTIVE FLIGHT PROGRAM
J. J. Poetker, C. H. Ronnenburg, and F. N. Sansone Sep. 1974 116 p
(Contract N00017-72-C-4401)
(AD-A008555; APL-JHU-TG-1260) Avail: NTIS CSCL 16/4

A Television Instrumentation System provides a data gathering and reduction system for use in the Harpoon Anti-Ship Missile Captive Flight Test Program being conducted at Pt. Mugu, California. The system is installed in an aircraft test bed that simulates the flight path of the Harpoon missile. The data are used to provide information concerning target acquisition, hit probability, miss distance, track noise, and ECCM performance. The system's electronic circuitry design and operational performance are described. GRA

N75-25003*# National Bureau of Standards, Boulder, Colo. Electromagnetics Div.
A RACK-MOUNTED PRECISION WAVEGUIDE-BELOW-CUTOFF ATTENUATOR WITH AN ABSOLUTE ELECTRONIC READOUT Final Report
Clarence C. Cook Nov. 1974 46 p refs Sponsored by NASA Prepared for JPL
(NASA-CR-142907; COM-75-10126/1; NBSIR-74-394) Avail: NTIS HC $3.75 CSCL 17B

A coaxial precision waveguide-below-cutoff attenuator is described which uses an absolute (unambiguous) electronic digital readout of displacement in inches in addition to the usual gear driven mechanical counter-dial readout in decibels. The attenuator is rack-mountable and has the input and output RF connectors in a fixed position. The attenuation rate for 55, 50, and 30 MHz operation is given along with a discussion of sources of errors. In addition, information is included to aid the user in making adjustments on the attenuator should it be damaged or disassembled for any reason. GRA

N75-25004# Army Electronics Command, Fort Monmouth, N.J.
UTILIZATION RIFLES FOR RADIO COMMUNICATION Final Report, Jan. - Sep. 1974
Kurt Ikrath, Edward Shaffer, and William Kennebeck Jan. 1975 61 p refs
(DA Proj. 1T1-61102-B-31A)
(AD-A008333; ECOM-4285) Avail: NTIS CSCL 17/2

The following topics are discussed: Operational considerations; Experiments with rifle-radios operating at HF (27 MHz); Experiments with rifle-radios operating at VHF (40-60 MHz); Miniature XMTR operating on 150 MHz for body and rifle; Use of magnetic rubber in radio-rifle coupling circuits. GRA

N75-25005# Michigan Univ., Ann Arbor. Radiation Lab.
THEORETICAL AND EXPERIMENTAL STUDY OF ARRAYS OF AXIAL SLOTS ON A CIRCULAR CYLINDER Final Scientific Report, 1 Sep. 1973 - 30 Jun. 1974
Dipak L. Sengupta and Joseph E. Ferris Aug. 1974 48 p refs
(Contract F19628-74-C-0020)
(AD-A007959; Rept-012131-1-F; AFCRL-TR-74-0420) Avail: NTIS CSCL 09/5

The radiation patterns produced by arrays of axial slots on a conducting circular cylinder of infinite length are studied theoretically and experimentally. The required phase of excitation of elements to produce a beam in a certain direction are obtained by approximating the array by a section of a circular array of isotropic sources. For the given radius of the cylinder and the frequency band of interest, the approximation is found to yield satisfactory results. Radiation patterns produced by arrays of 2, 3 and 4 axial slots are numerically computed and discussed. Theoretical results are also compared with measured results and the agreement between the two has been found satisfactory. GRA

N75-25006# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
A STUDY OF PHASED ARRAY ANTENNA PATTERNS DETERMINED BY MEASUREMENTS ON A NEAR-FIELD RANGE Final Technical Report, 12 Dec. 1973 - 11 Jan. 1975
G. P. Rodrigue, E. B. Joy, G. K. Huddleston, C. P. Burns, and E. C. Burdette Mar. 1975 331 p refs
(Contract DAAH01-74-C-0367)
(AD-A008026; GIT-A-1588-F) Avail: NTIS CSCL 09/5

The validity of the near-field measurement technique in the determination of the far-field radiation patterns of large phased arrays is demonstrated. The significance of accurately characterizing the near-field probe at all angles of interest is demonstrated. A new method of processing the Fast Fourier Transform has been developed that allows increased pattern resolution and reduced core memory requirements. The measurement of absolute gain has been carried out by a new approach using a standard gain horn. The accuracy of this method is demonstrated. A computer-aided simulation study of near-field errors has been conducted using an empirical base model for the illumination function determined from measurements in the near field. GRA

N75-25007# CNR, Inc., Newton Upper Falls, Mass.
TROPOSCATTER INTERLEAVER STUDY REPORT Technical Report, Feb. - Sep. 1974
David Chase, Phillip A. Bello, Lih-Jyh Weng, and Richard W. Spencer Feb. 1975 255 p refs
(Contract F30602-74-C-0133; AF Proj. 478T)
(AD-A008523; RADC-TR-75-19) Avail: NTIS CSCL 17/2

The report represents a detailed investigation of the application of error-correcting coding techniques for troposcatter communications. The importance of time domain coding techniques, which require a certain amount of decoding delay, is demonstrated. Minimization of this required decoding delay is achieved by certain new adaptive coding techniques which require less decoding delay than the more conventional interleaved coding approaches. For tactical troposcatter links operating with single or dual diversity links, it is anticipated that a coding gain (reduction in the required transmitter power to achieve an error rate below 0.00001 in the order of 10 db should be typical with decoding delays as short as 1/4 second. This savings in transmitted power strongly suggests that single or dual diversity tactical troposcatter links, which use efficient error-correction coding concepts, are not only feasible but also represent an attractive and cost-effective alternative to the more conventional quad diversity configurations. GRA

N75-25008# Eagle-Picher Co., Joplin, Mo. Couples Dept.
MANUFACTURING METHODS AND TECHNOLOGY MEASURE FOR PLASTIC HOUSINGS FOR C-2328-B-GRA-39 AND C-2329-B-GRA-39 RADIO Quarterly Progress Report, 1 Aug. - 31 Oct. 1974
Dale V. Gordon 14 Mar. 1975 10 p refs
(Contract DAAB05-73-C-2081)
(AD-A008400; QPR-5) Avail: NTIS CSCL 17/2

The objective of this project is to perform the production engineering required to permit the replacement of aluminum housings with molded plastic housings for the AN/GRA-39B Radio Telephone. GRA

N75-25009# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOCIALISTIC COMMUNICATIONS
A. Hudec 18 Mar. 1975 8 p Transl. into ENGLISH from PTT Revue (Czechoslovakia), v. 4, no. 5, 1973 p 6
(AD-A007942; FTD-HC-23-0846-75) Avail: NTIS CSCL 17/2

The development of telecommunications and the improvement of postal services in socialist countries are discussed. Management planning and control were analyzed. M.J.S.

N75-25010# Joint Tactical Communications Office, Fort Monmount, N.J.
TRI-TAC TECHNOLOGY FORECAST Final Report
Oct. 1974 157 p refs
(AD-A008552; TTO-ORT-035-74) Avail: NTIS CSCL 17/2

The report presents the documentation of interviews, a literature review, and technology forecasts which relate to the state-of-the-art of military tactical communication systems for the 1975-1980 time frame. The interviews were conducted at various Government laboratories and selected industry facilities. Technical areas for which forecasts were made include microelectronics, computers/switching, satellite subsystems, optical communication, power sources, RF power generation, and information processing. Most technological projections that are documented have been obtained from the interview and literature sources. Independent assessment and forecasting have been limited to assessing the impact of rapidly improving technologies on the development of future tactical military communication equipment. GRA

N75-25011# Naval Undersea Center, San Diego, Calif.
IMAGE TRANSMISSION VIA SPREAD SPECTRUM TECHNIQUES Quarterly Technical Report, 1 Jul. 1974 - 1 Jul. 1975
1 Jan. 1975 96 p refs
(AD-A008563; QTR-5) Avail: NTIS CSCL 17/2

Progress on a real time television bandwidth reduction system is reported. The system makes use of hybrid transform coding: a discrete cosine transform in the horizontal direction and a differential pulse code modulator in the vertical direction. Progress on a three dimensional system is also reported. GRA

N75-25012# Naval Research Lab., Washington, D.C.
AVQ 20A AZIMUTH INDICATOR DRIVER Interim Report
Alan H. Rich Mar. 1975 15 p
(NRL Proj. R06-47C)
(AD-A008544; NRL-MR-2991) Avail: NTIS CSCL 17/9

A dummy servo circuit was designed and built to allow selection of any one of five radar azimuth following pot outputs, to normalize each of these voltages, and to drive the sweep angle of the RCA AVQ 20A console as a linear function of the selected azimuth. The servo translates input dc voltages to shaft rotation, driving a resolver of the type used in the 20A sweep circuit such that plus or minus 20 degrees sweep corresponds to plus or minus 10 V normalized input voltage. GRA

N75-25013# Army Foreign Science and Technology Center, Charlottesville, Va.
REMOVING THE ELECTROMAGNETIC FIELD OF A LOW-FREQUENCY DIPOLE IN ROCKS
I. F. Ogorodneichuk, I. Ya. Zhuravlev, and A. I. Bykh 27 Sep. 1974 10 p refs Transl. into ENGLISH from Pribory Sistemy Avtomatiki (USSR), no. 8, 1969 p 70-74
(AD-A008265; FSTC-HT-23-907-74) Avail: NTIS CSCL 17/2

For short-ranges, transmission along rocks is cheaper and more reliable than competing methods. Signal attenuation, the basic drawback to this method, can be reduced by lowering transmission frequency. Theoretical and experimental studies have been carried out in the laboratory on the propagation of audio-frequency electromagnetic waves in the rocks of coal mines. The choice of an emitter has also been considered. GRA

N75-25014# Naval Research Lab., Washington, D.C.
THE USE OF BROADBAND SIGNALS FOR UNDERWATER ACOUSTIC TRANSDUCER CALIBRATION Interim Report
A. Zed Robinson, Jr. and L. G. Beatty 17 Apr. 1975 63 p refs
(AD-A008324; NRL-7883) Avail: NTIS CSCL 09/1

A preliminary study of the potential use of broadband signals for underwater acoustic transducer calibration has been made. Emphasis was placed on pulses of a single cycle of a sinusoidal wave as the calibration signal. The experiments involved digital sampling of the current and voltage response waveforms, generating the Fourier transforms of these responses, and combining the transforms to provide the desired calibration curves. The results were considered comparable to those obtained with conventional operational systems, even though smoothing was not applied to the data and even though compromises were required in performing the experiments. Preliminary noise analyses included the development of certain useful probability density functions and cumulative probability distribution functions. Curves to illustrate these probability functions are plotted. Some interpretation of noise effects is given. Future research plans are described briefly. GRA

N75-25015# Radio Corp. of America, Cape Kennedy, Fla.
A PROPOSAL FOR COMMUNICATION AND COMMAND CONTROL AIRBORNE RELAY
H. B. Davis 23 Jan. 1974 48 p refs
(Contract F08505-74-C-0025)
(AD-A008284; RCA/TELTA-TR-74-044; AFETC-TR-75-15)
Avail: NTIS CSCL 17/2

The report discusses the need for an integrated airborne communication/command relay system for fire suppression operations and the application of tethered balloon-borne equipment for a communication/command control relay. It may be used for communication between fire fighting, rescue team, or other mobile emergency groups operating in remote forest areas. GRA

N75-25016# Naval Research Lab., Washington, D.C.
MTI OPTIMIZATION IN A MULTIPLE-CLUTTER ENVIRONMENT Interim Report
James K. Hsiao 20 Mar. 1975 22 p refs
(NRL Proj. R02-86; RF12151403)
(AD-A008143; NRL-7860) Avail: NTIS CSCL 17/9

A means of optimizing an MTI filter for rejecting several types of clutter, which is generated by different mechanisms such as by rain or the ground, is formulated. It is found that the optimal performance of such a filter depends on the spectral density functions, average radar cross sections, and the relative mean Doppler frequencies of each type of clutter. It is shown that the optimal improvement factor of such a filter is bounded by the weighted average (weighted in accordance with the radar cross sections of the clutter types) of the improvement factor for the individual clutter type. It is also shown that the improvement factor of a filter is bounded by two limits. Both of these limits are a function of the relative mean doppler frequency f sub o between the clutter types. As f sub o increases, the performance of the MTI system degrades. The worst improvement factor occurs when f sub o is equal to half of the radar prf.
GRA

N75-25017# Naval Electronics Lab. Center, San Diego, Calif.
OPTICAL SATCOM Quarterly Technical Report, 1 Jan. - 31 Mar. 1975
D. R. Leonard and E. L. Dix 31 Mar. 1975 10 p refs
(AD-A008190) Avail: NTIS CSCL 17/2

The primary objectives of the Experiment are the following: Determine, qualitatively, whether optical heterodyne communications is feasible under marine weather conditions, including transmission through clouds; and, develop, quantitatively, data needed to validate theoretical models of such propagation. The experiment will be conducted in three phases: as follows: Calibration of transceiver units; Field checkout of the units with some support measurement at San Diego; and, Field experiment at Hawaii. The basic technique employed will be to measure the transceiver carrier-to-noise (C/N) ratio as a function of the optical thickness of the cloud filling the propagation path. GRA

N75-25018# Aerospace Corp., El Segundo, Calif.
AN ANALYSIS OF THE FRESNEL REGION OF A LARGE PARABOLIC COMMUNICATION ANTENNA WITH THE SCALAR DIFFRACTION THEORY
Michael T. Tavis Jul. 1974 60 p refs
(Contract F04701-74-C-0075)
(AD-A008509; TR-0075(5901-02)-1; SAMSO-TR-75-84) Avail: NTIS CSCL 09/5

Spacecraft antennas that are very large in terms of a wavelength present special problems after they are installed on the vehicle in that final tests to verify that no changes in the antenna performance have occurred during storage, handling, and installation can seldom be performed under far-field conditions. This report investigates the feasibility of making final measurements at distances that would be practical in typical assembly buildings. The data channel patterns and tracking patterns of a typical parabolic reflector communications antenna in the radiating near-field region are examined in this report using the Fresnel approximation to the scalar diffraction theory. GRA

N75-25019# Advanced Technology Center, Inc., Dallas, Tex.
AN EXPERIMENTAL STUDY OF THE EFFECT OF A THIN PLASMA LAYER ON HIGH POWER MICROWAVE TRANSMISSION
William H. Rudderrow Dec. 1974 58 p refs
(Contract F19628-73-C-0140; AF Proj. 4642)
(AD-A008514; ATC-B-94300/5CR-3; AFCRL-TR-75-0098; SR-2) Avail: NTIS CSCL 20/14

Measurements of the transmission and reflection of a plasma covered aperture antenna have been made for a wide range of plasma conditions and incident power level. The low power results appear to be adequately predicted for thin plasma layers by Fante's impedance sheet theory. Thick plasma layers require a more sophisticated treatment to account for the dispersive qualities of a non-uniform plasma. High power effects appear to be quite strong with nonlinear effects appearing at a few hundred watts of incident power. The nonlinear effects are also significant when the plasma is overdense. For the experimental test condition, a peak power of 2 kW appears to be an optimum power level for maximum received power. Author

N75-25020*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE DEEP SPACE NETWORK Progress Report, Mar. - Apr. 1975
15 Jun. 1975 210 p
(Contract NAS7-100)
(NASA-CR-142944; PR-42-27) Avail: NTIS HC $7.25 CSCL 17B

The objectives, functions, and organization of the Deep Space Network are summarized. Deep space station, ground communication, and network operations control capabilities are described.
Author

N75-25021# AEG-Telefunken, Backnang (West Germany). Telecommunications and Cables Div.
STUDY OF CONVERSION REPEATERS IN VIEW OF THE REQUIREMENTS FOR SPECTRUM EFFICIENT MODULATION SYSTEMS IN THE UP-LINK TO BROADCAST SATELLITES, VOLUME 2 Final Report
Oct. 1974 257 p refs
(Contract ESRO-SC/18/73-HQ)
(ESRO-CR(P)-590-Vol-2) Avail: NTIS HC $8.50

Techniques and equipment for the uplink of a TV broadcasting satellite are discussed. The uplink systems considered are narrowband TM and two types of differential PCM, differing in digitalization method, modulation, and access. For individual titles, see N75-25022 through N75-25036.

N75-25022 AEG-Telefunken, Backnang (West Germany).
DPCM ENCODING OF VIDEO COMPONENTS
In its Study of Conversion Repeaters in View of the Requirements for Spectrum Efficient Modulation Systems in the Up-link to Broadcast Satellites, Vol. 2 Oct. 1974 40 p refs (For availability see N75-25021 16-32)

Basic aspects of DCPM video signal component encoding systems are discussed and a solution is selected for the uplink considered. A short review is presented of the statistical characteristics of the TV signal, which are used for redundancy reduction, and of subjective viewing criteria, which are to be considered for further transmission rate reduction by suppression of superfluous information. The principal methods for achieving transmission rate reduction in DPCM encoding are described. A solution for the uplink is presented. ESRO

N75-25023 AEG-Telefunken, Backnang (West Germany).
PERFORMANCE OF MULTILEVEL FSK SYSTEMS
In its Study of Conversion Repeaters in View of the Requirements for Spectrum Efficient Modulation Systems in the Up-link to Broadcast Satellites, Vol. 2 Oct. 1974 30 p refs (For availability see N75-25021 16-32)

The error performance of a 4 level FSK system with integrate-and-dump detection was investigated for broadcasting satellite uplinks. The standard theory was found insufficient for multilevel FSK systems since it neglects distortion effects. With system parameters as proposed in literature, a degradation of about 10 db is to be expected owing to distortion. By applying a detection with an integration Ti less than T, where T is the nominal pulse duration, the degradation due to distortion can be reduced to about 5 db. It is concluded that 4 level FSK is about 3-4 db poorer in performance than 4 level PSK. Hence, in spite of its comparatively simple receiver, FSK modulation in the uplink is not recommended. ESRO

N75-25024 AEG-Telefunken, Backnang (West Germany).
PERFORMANCE OF MULTILEVEL PSK SYSTEMS
In its Study of Conversion Repeaters in View of the Requirements for Spectrum Efficient Modulation Systems in the Up-link to Broadcast Satellites, Vol. 2 Oct. 1974 35 p refs (For availability see N75-25021 16-32)

A review of differential and coherent PSK systems for satellite broadcasting uplinks is presented, and the differentially coherent PSK (DCPSK) is discussed. Aspects covered are noise performance, cochannel interference, adjacent channel interference, linear and nonlinear distortion, and the performance of recovery circuits. ESRO

N75-25025 AEG-Telefunken, Backnang (West Germany).
DIGITAL UPLINK BUDGETS
In its Study of Conversion Repeaters in View of the Requirements for Spectrum Efficient Modulation Systems in the Up-link to Broadcast Satellites, Vol. 2 Oct. 1974 10 p refs (For availability see N75-25021 16-32)

Budgets for 8 phase and 4 phase differentially coherent PSK systems for, respectively, FDMA and TDMA uplinks were investigated, and the required ground station transmission power was evaluated. For the 8 phase DCPSK/FDMA budget the bit error rate, the transmitter antenna, and the effect of interference and distortion were considered to determine the required ground station power. Calculations demonstrate the feasibility of an 8 phase DCPSK system without any error correction. Even for a small antenna of 8.5 m diameter sufficient power margin is left; in case a 2 kW ground station travelling wave tube amplifier is available. For 4 phase DCPSK/TDMA, it is shown that the required ground transmission power is similar for 4 channels with 4 phase DCPSK/TDMA and for 8 phase DCPSK/FDMA. ESRO

N75-25026 AEG-Telefunken, Backnang (West Germany).
FUNCTIONAL DETAILS OF THE 8 PHI MODULATOR
In its Study of Conversion Repeaters in View of the Requirements for Spectrum Efficient Modulation Systems in the Up-link to Broadcast Satellites, Vol. 2 Oct. 1974 11 p refs (For availability see N75-25021 16-32)

The 8 phase differentially coherent PSK demodulator for the broadcasting satellite uplink is described. A block diagram is used to explain its function. The demodulator receives the PSK signal at the suitable IF of 70 MHz. At the input this signal is divided into two parts for feeding the signal path and the carrier recovery. The demodulator is divided into five sub-units; demodulator, distribution network and pulse shaper, decoder, carrier recovery, and bit timing recovery. ESRO

N75-25027 AEG-Telefunken, Backnang (West Germany).
TV DEMULTIPLEXER OF FDMA REPEATER
In its Study of Conversion Repeaters in View of the Requirements for Spectrum Efficient Modulation Systems in the Up-link to Broadcast Satellites, Vol. 2 Oct. 1974 13 p ref (For availability see N75-25021 16-32)

Functional details and design requirements are presented for the selected TV demultiplexer concept in the FDMA repeater of a broadcasting satellite uplink. TV words supplied by the series/parallel converter with receive signal bit clock frequency are shifted into the TV demultiplexer at the same frequency and transferred to the digital/analog converters in real time. The demultiplexer separates the receive time obtained from receive signal bit clock, and the transmitter time generated in the satellite. Variations between these times must be compensated for in the demultiplexer. ESRO

N75-25028 AEG-Telefunken, Backnang (West Germany).
FUNCTIONAL DETAILS OF THE DPCM DECODER
In its Study of Conversion Repeaters in View of the Requirements for Spectrum Efficient Modulation Systems in the Up-link to Broadcast Satellites, Vol. 2 Oct. 1974 5 p (For availability see N75-25021 16-32)

Design principles and functional details of the DPCM decoders for the broadcasting satellite uplink are described. These decoders are used for the 4-bit video signal components. The effects of transmission errors are also discussed. ESRO

N75-25029 AEG-Telefunken, Backnang (West Germany).
COMB FILTER
In its Study of Conversion Repeaters in View of the Requirements for Spectrum Efficient Modulation Systems in the Up-link to Broadcast Satellites, Vol. 2 Oct. 1974 17 p (For availability see N75-25021 16-32)

Details of broadcasting satellite comb filter design for the three video signal components are described. The filter is needed after digital/analog conversion of the video signal in order to suppress interfering lines resulting from overlapping luminance and chrominance band spectra. The comb filter has a considerable number of periodic stop and pass bands. ESRO

N75-25030 AEG-Telefunken, Backnang (West Germany).
PAL ENCODER
In its Study of Conversion Repeaters in View of the Requirements for Spectrum Efficient Modulation Systems in the Up-link to Broadcast Satellites, Vol. 2 Oct. 1974 5 p (For availability see N75-25021 16-32)

Details of a phase alternating line encoder are presented. The equipment reconstructs the complete video signal from the three TV components available in the baseband, luminance signal and two chrominance signals, onboard a broadcasting satellite. ESRO

N75-25031 AEG-Telefunken, Backnang (West Germany).
FUNCTIONAL DETAILS OF THE SYNCHRONIZATION UNIT IN THE FDMA REPEATER
In its Study of Conversion Repeaters in View of the Requirements for Spectrum Efficient Modulation Systems in the Up-link to Broadcast Satellites, Vol. 2 Oct. 1974 13 p (For availability see N75-25021 16-32)

The operating principle of the synchronization unit in the FDMA repeater is explained. The unit supplies all pulses necessary to control the read-in and read-out operations in the digital repeater section. All analog signals, required for video signal reconstruction according to PAL-G standards, are generated in this unit. ESRO

N75-25032 AEG-Telefunken, Backnang (West Germany).
RELIABILITY CALCULATIONS FOR THE FDMA REPEATER
In its Study of Conversion Repeaters in View of the Requirements for Spectrum Efficient Modulation Systems in the Up-link to Broadcast Satellites, Vol. 2 Oct. 1974 36 p ref (For availability see N75-25021 16-32)

Reliability block diagrams of the FDMA repeater are presented and the reliability calculation is described. The modulation conversion part of the FDMA repeater has a reliability of 0.95 assuming the transmission of one TV channel plus two related MQS channels and a five year mission time. A reliability calculation is performed for the selected minimum mass and minimum dc power consumption concept. ESRO

N75-25033 AEG-Telefunken, Backnang (West Germany).
CALCULATION OF CARRIER-TO-NOISE RATIO IN THE NBFM UPLINK
In its Study of Conversion Repeaters in View of the Requirements for Spectrum Efficient Modulation Systems in the Up-link to Broadcast Satellites, Vol. 2 Oct. 1974 8 p (For availability see N75-25021 16-32)

Assumptions for, and results of, the uplink carrier to noise ratio calculation are described for the narrowband FM uplink. Only the TV uplink carriers are considered quantitatively since they are more critical than the sound uplink carriers. For the RF bandwidth of 18 MHz the carrier to noise ratio is approximately 32 db. ESRO

N75-25034 AEG-Telefunken, Backnang (West Germany).
NBFM UPLINK BUDGET
In its Study of Conversion Repeaters in View of the Requirements for Spectrum Efficient Modulation Systems in the Up-link to Broadcast Satellites, Vol. 2 Oct. 1974 7 p refs (For availability see N75-25021 16-32)

The narrowband FM uplink budget for the TV carrier of a broadcasting satellite is described. The required ground station transmission power was calculated for two antenna diameters. ESRO

N75-25035 AEG-Telefunken, Backnang (West Germany).
FREQUENCY ARRANGEMENT IN THE NBFM UPLINK
In its Study of Conversion Repeaters in View of the Requirements for Spectrum Efficient Modulation Systems in the Up-link to Broadcast Satellites, Vol. 2 Oct. 1974 8 p (For availability see N75-25021 16-32)

The necessary channel spacing in dual polarization narrowband FM TV broadcasting satellite uplinks was derived. The guard band between adjacent channels of one polarization was determined with a simple trapezoidal spectrum model. The required carrier-to-cochannel interference (C/I) ratio is at least 36 db. It was found that for narrowband FM-TV-channels of 18 MHz bandwidth the required guard band is 13.3 MHz minimum in order to meet the C/I requirement, which means that the frequency band efficiency can be increased by about only 25% with dual polarization transmission. ESRO

N75-25036 AEG-Telefunken, Backnang (West Germany).
CRITICAL DISTORTION EFFECTS IN THE NBFM REPEATER
In its Study of Conversion Repeaters in View of the Requirements

for Spectrum Efficient Modulation Systems in the Up-link to Broadcast Satellites, Vol. 2 Oct. 1974 9 p (For availability see N75-25021 16-32)

The critical distortion effects in the narrowband FM/FM repeater are briefly discussed. The carrier to noise degradation at the multiplier output is considered in relation to the noise performance of a multiplier device. Carson's rule was used to determine downlink out-of-band emission due to modulation conversion in the repeater. Three configurations of the repeater were examined, two of them with a limiter for controlling differential distortion. ESRO

N75-24978 Joint Publications Research Service, Arlington, Va.
THE EFFECT OF THE WATER-AIR INTERFACE ON THE TRANSMISSION OF AM AND FM SIGNALS
Ya. Ye. Belenkiy *In its* Signal Selection and Transmission (JPRS-64817) 21 May 1975 p 34-39 refs Transl. into ENGLISH from Otbor i Peredacha Informatsii (Kiev), no. 25, 1970 p 122-126 (For availability see N75-24973 16-31)

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N75-25037 British Library Lending Div., Boston Spa (England).
MEASUREMENT OF HIGH VOLTAGES WITH THE AID OF THE ELECTRO-OPTICAL KERR EFFECT
T. Horinouchi 14 May 1974 19 p refs Transl. into ENGLISH from Keisoku Jido Seigyo Gakkai Rombunshu (Japan), v. 8, no. 3, Jun. 1972 p 286-293
(BLL-CE-Trans-6339-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Data show the experimental results of the temperature characteristic, polarization characteristic, insulation breaking characteristic etc. of nitrobenzene filled in a Kerr cell as well as results of measurements obtained by applying dc-high voltage, ac-high voltage, or high frequency high voltage to the Kerr cell. In practice, various matters have to be taken into consideration, particularly the fact that the degree of purity of the nitrobenzene is a very large factor in succeeding in measurement by this method. The range of measurement may be extended by increasing the gap formed between the electrodes of the Kerr cell. The linearity of the measuring range is good. The present method is easier in applying voltages and more advantageous as an apparatus for measuring the high voltage than the conventional method with the aid of Pockel's effect which makes use of such solids as ADP and KDP. Author

N75-25038 British Library Lending Div., Boston Spa (England).
GAS SUPPLY IN SF6-INSULATED HIGH-VOLTAGE SWITCHGEAR
W. Heilmann 4 Oct. 1974 14 p refs Transl. into ENGLISH from Energiewirtschaftliche Tagesfragen (West Ger.), v. 22, no. 10, Oct. 1972 p 526-532
(BLL-CE-Trans-6197-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The general properties of sulphur hexafluoride (SF6) as an insulating medium and as an arc-extinguishing medium in circuit breakers are given. Humidity effects and maintenance of breakdown strength in service are considered along with supplying the switchgear with insulating gas and gas consumption. J.M.S.

N75-25039 British Library Lending Div., Boston Spa (England).
TESTING OF INDUCTION MOTORS BY MEANS OF A TWO FREQUENCY SUPPLY
A. W. Kron 4 Oct. 1974 23 p refs Transl. into ENGLISH from ETZA (West Ger.), v. 94, no. 2, Feb. 1973 p 77-82
(BLL-CE-Trans-6179-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

The two frequency method used to test an asynchronous machine independently of its rotor construction, pole number, and vertical or horizontal position of the power take-off shaft is described. The losses are in general greater than at rated power output with only one frequency but the measured temperature rises of the windings are a satisfactory approximate measure for the temperature in rated operation, when the additional losses which occur affect the temperature of the rotor but not so much that of the stator. Author

N75-25040* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DIGITAL PHASE-LOCKED LOOP Patent
Rodger A. Cliff, inventor (to NASA) Issued 13 May 1975 7 p Filed 20 Aug. 1973 Supersedes N73-31202 (11 - 22, p 2646)
(NASA-Case-GSC-11623-1; US-Patent-3,883,817; US-Patent-Appl-SN-389929; US-Patent-Class-331-1A; US-Patent-Class-331-18; US-Patent-Class-331-25) Avail: US Patent Office CSCL 09C

An digital phase-locked loop is provided for deriving a loop output signal from an accumulator output terminal. A phase detecting exclusive OR gate is fed by the loop digital input and output signals. The output of the phase detector is a bi-level digital signal having a duty cycle indicative of the relative phase of the input and output signals. The accumulator is incremented at a first rate in response to a first output level of the phase detector and at a second rate in response to a second output level of the phase detector.
Official Gazette of the U.S. Patent Office

N75-25041* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DIODE-QUAD BRIDGE CIRCUIT MEANS Patent
Dean R. Harrison and John Dimeff, inventors (to NASA) Issued 13 May 1975 7 p Filed 16 Jan. 1974 Continuation-in-part of abandoned US Patent Appl. SN-209618, Filed 20 Dec. 1971
(NASA-Case-ARC-10364-2; US-Patent-3,883,812; US-Patent-Appl-SN-433968; US-Patent-Class-329-166; US-Patent-Class-307-321; US-Patent-Class-324-DIG.1; US-Patent-Class-329-204; US-Patent-Appl-SN-209618) Avail: US Patent Office CSCL 09C

Diode-quad bridge circuit means is described for use as a transducer circuit or as a discriminator circuit. It includes: (1) a diode bridge having first, second, third, and fourth bridge terminals consecutively coupled together by four diodes polarized in circulating relationship; (2) a first impedance connected between the second bridge terminal and a circuit ground; (3) a second impedance connected between the fourth bridge terminal and the circuit ground; (4) a signal source having a first source terminal capacitively coupled to the first and third bridge terminals, and a second source terminal connected to the circuit ground; and (5) an output terminal coupled to the first bridge terminal and at which an output signal may be taken.
Official Gazette of the U.S. Patent Office

N75-25042# Pisa Univ. (Italy).
NEW GENERAL CONFIGURATION AND NEW SYNTHESIS PROCEDURE FOR ALL PASS NETWORKS OF THE RC TYPE
A. Liberatore and E. Bahrabadi [1971] 16 p refs Transl. into ENGLISH from Alta Freq. (Italy), v. 40, no. 3, Mar. 1971 p 219-224
(Rept-1467) Avail: NTIS HC $3.25

A circuit configuration is described, in which use is made of a differential operational amplifier, and two-parts of the RC type network mounted on a Wien bridge, for the realization of all-pass networks. It is shown that this configuration is more general than that discussed by P. Williams, since in contrast to the latter, it includes all the all-pass RC networks, which have appeared up to now in the technical literature, and which were realized by differential operational amplifiers with a very large gain. A new synthesis procedure for all-pass transfer functions is described. Author

N75-25043*# Westinghouse Electric Corp., Pittsburgh, Pa. Research Lab.
DEVELOPMENT OF A 1000V, 200A, LOW-LOSS, FAST-

SWITCHING, GATE-ASSISTED TURN-OFF THYRISTOR
Interim Report
E. S. Schlegel and L. R. Lowry 31 Mar. 1975 72 p
(Contract NAS3-16801)
(NASA-CR-134786; Rept-75-9G5-GATTT-R1) Avail: NTIS HC $4.25 CSCL 09C

Feasibility was demonstrated for a thyristor that blocks 1000V forward and reverse, conducts 200A, and turns on in little more than 2 microsec with only 2A of gate drive. Its features include a turn-off time of 3 microsec achieved with 2A of gate assist current of a few microseconds duration and an energy dissipation of only 12 mJ per pulse for a 20 microsec half sine wave, 200A pulse. Extensive theoretical and experimental study of the electrical behavior of thyristors having a fast turn-off time have significantly improved the understanding of the physics of turning thyristor off. Thyristors of two new designs were fabricated and evaluated. The high speed and low power were achieved by a combination of gate amplification, cathode shunting, and gate-assisted turn-off. Two techniques for making this combination practical are described. Author

N75-25044*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INVESTIGATION OF DISCRETE COMPONENT CHIP MOUNTING TECHNOLOGY FOR HYBRID MICROELECTRONIC CIRCUITS
Salvadore V. Caruso (IBM Huntsville, Ala.) and J. O. Honeycutt May 1975 60 p
(NASA-TM-X-64937) Avail: NTIS HC $4.25 CSCL 09C

The use of polymer adhesives for high reliability microcircuit applications is a radical deviation from past practices in electronic packaging. Bonding studies were performed using two gold-filled conductive adhesives, 10/90 tin/lead solder and Indalloy no. 7 solder. Various types of discrete components were mounted on ceramic substrates using both thick-film and thin-film metallization. Electrical and mechanical testing were performed on the samples before and after environmental exposure to MIL-STD-883 screening tests. Author

N75-25045# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
EQUIVALENTS OF SYNCHRONOUS GENERATORS FOR CALCULATING THE DYNAMIC STABILITY OF ELECTRICAL SYSTEMS
I. F. Shtarkl 1975 9 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR. Energ. i Transp. (USSR), v. 5, 1972 p 32-36
(NRC-TT-1795) Avail: NTIS HC $3.25

A method of equivalent representation of synchronous generators for complex electrical systems is suggested, based on a reduction in the total number of differential equations of the rotor movement. The method does not require preliminary equivalents of sections of complex systems in the initial steady-state regimes and makes it possible to decide whether, in a given case equivalent, representation was justifiable. Results of calculations for a five-generator system are given. Author

N75-25046# Joint Publications Research Service, Arlington, Va.
PRINCIPLES OF CONSTRUCTION AND POSSIBILITIES OF MINIATURIZING LOW FREQUENCY SELECTIVE CIRCUITS
N. V. Gordiyenko, D. S. Kazmiruk, L. A. Kiselev, and M. Z. Chapovskiy 21 May 1975 12 p refs Transl. into ENGLISH from Sudostroyeniye (Leningrad), no. 2, 1972 p 52-56
(JPRS-64823) Avail: NTIS HC $3.25

Data from theoretical and experimental investigations on developing principles for the design of active RC filters, and on the creation of engineering methods for their design and calculation are presented. Author

N75-25047# Advisory Group for Aerospace Research and Development, Paris (France).
CUSTOM DESIGN FOR LARGE SCALE INTEGRATION (LSI)
Apr. 1975 150 p refs Conf. held at Paris 21-22 Apr. 1975; at London 24-25 Apr. 1975; at Rome 28-29 Apr. 1975
(AGARD-LS-75) Avail: NTIS HC $5.75

The techniques and methods of designing custom circuits for large scale integration are outlined. Circuit design lectures are presented which cover metal oxide semiconductor, bipolar, and standard cell monolithic technology in addition to film hybrid techniques for multi-chip modules. The preparation of master artwork by computer graphics and the establishment of satisfactory quality assurance interfaces are also discussed. For individual titles, see N75-25048 through N75-25053.

N75-25048 Plessey Co. Ltd., Towcester (England).
HIGH PERFORMANCE BIPOLAR TECHNOLOGY FOR LSI
P. C. Newman *In* AGARD Custom Design for Large Scale Integration (LSI) Apr. 1975 22 p refs (For availability see N75-25047 16-33)

The Plessey bipolar process 3 and the Fairchild isoplanar process are described in detail. Performance characteristics of the basic npn transistors in process 3 are briefly discussed. Some circuit designs conducted on the two processes include a programmable logic array, an error detector for digital transmissions, and random access 256- and 1024-bit memories. Injection logic is described and its impact on large scale integration and processing technology is discussed. L.B.

N75-25049 Associated Semiconductor Manufacturers, Ltd., Southampton (England).
THE DESIGN OF MOS INTEGRATED CIRCUITS
R. A. Hilbourne *In* AGARD Custom Design for Large Scale Integration (LSI) Apr. 1975 20 p refs (For availability see N75-25047 16-33)

The principles, constraints, and techniques which determine the methods used for the design of metal oxide semiconductor integrated circuits are described. The two basic approaches are unichannel circuits, using either p or n channel transistors, and complementary circuits, using a combination of both types of transistors. The technologies and circuit implications of these two approaches are discussed and related to the large scale integration requirements of high packing density and low power dissipation per gate. The concepts of dynamic and static logic and the advantages of combining enhancement and depletion devices in a circuit are included. The design procedure is described and circuit subsystems and the complete circuit are simulated on a computer to ensure proper operation. The mask circuit layout is also simulated the check for correspondence with logic simulation. Author

N75-25050 Mullard, Ltd., Mitcham (England).
FILM HYBRID CIRCUITS FOR LSI
Mervyn G. Harwood *In* AGARD Custom Design for Large Scale Integration (LSI) Apr. 1975 16 p refs (For availability see N75-25047 16-33)

Thick and thin film hybrid technologies are discussed for use with large scale integrated devices. Materials used for the passive portion of the circuit and their properties are outlined, with particular attention to interaction with bonding materials. Types of integrated and attached components are included (i.e. resistors, capacitors, and semiconductors) and materials and techniques most suitable for attaching components to the film circuit are indicated. The effects of environmental treatment and of various packaging methods are considered, and damage prevention measures are established. Basic design guidelines are given. Author

N75-25051 Calma Co., Wiltshire (England).
INTERACTIVE GRAPHICS AND ARTWORK PREPARATION
Michael A. Northwood *In* AGARD Custom Design for Large Scale Integration (LSI) Apr. 1975 6 p (For availability see N75-25047 16-33)

The techniques available to produce final production artwork from an engineering layout sketch are described. Various computer aids capable of assisting in the design and production of the large scale integration layout are examined, with emphasis on the use of interactive graphics systems. The hardware components and software facilities of the graphics systems are described in detail. Machines for transferring circuit layout from a computer data base to final production artwork are examined. The merits and disadvantages of the techniques of cutting, scribing, photoplotting, and pattern generation are weighed. Author

N75-25052 Motorola, Inc., Phoenix, Ariz. Semiconductor Products Div.
QUALITY ASSURANCE ASPECTS OF CUSTOM LSI
J. L. Flood *In* AGARD Custom Design for Large Scale Integration (LSI) Apr. 1975 26 p refs (For availability see N75-25047 16-33)

The importance of standardizing the design, manufacturing, and testing of custom large scale integrated circuits is emphasized to assure high quality and reliability. The complexities of manufacturing and electrical testing standardization are outlined and the need for inspector/vendor/customer interaction is suggested. L.B.

N75-25053* Radio Corp. of America, Camden, N.J.
DESIGN AUTOMATION TECHNIQUES FOR CUSTOM LSI ARRAYS
Albert Feller *In* AGARD Custom Design for Large Scale Integration (LSI) Apr. 1975 15 p (For availability see N75-25047 16-33)
(Contracts NAS12-2233; NAS8-29072; DAAB07-0176)
CSCL 09C

The standard cell design automation technique is described as an approach for generating random logic PMOS, CMOS or CMOS/SOS custom large scale integration arrays with low initial nonrecurring costs and quick turnaround time or design cycle. The system is composed of predesigned circuit functions or cells and computer programs capable of automatic placement and interconnection of the cells in accordance with an input data net list. The program generates a set of instructions to drive an automatic precision artwork generator. A series of support design automation and simulation programs are described, including programs for verifying correctness of the logic on the arrays, performing dc and dynamic analysis of MOS devices, and generating test sequences. Author

N75-25054*# Hi-Shear Corp., Torrance, Calif.
THE DESIGN AND DEVELOPMENT OF A HIGH VOLTAGE POWER SUPPLY Final Report
Robert Ting 2 Dec. 1974 46 p
(Contract NAS8-29858)
(NASA-CR-143861) Avail: NTIS HC $3.75 CSCL 09C

A high voltage circuit system was redesigned, breadboarded, and tested to meet revised specification requirements. Circuit component subassemblies are described and include the firing unit, regulator, dc to dc converter, and output and trigger circuits. Design changes, tests, and equipment fabrication are outlined chronologically by month. A list of design specifications is included. L.B.

N75-25055# Pisa Univ. (Italy).
ON THE POSSIBILITY OF USING HOMOPOLAR MOTORS AS SERVOMOTORS [SULLA POSSIBILITA DI IMPIEGO DEL MOTORE OMOPOLARE COME SERVOMOTORE]
A. Bramanti, R. Dalmazzo, and A. Tellini 1972 33 p refs In ITALIAN
(Rept-1462) Avail: NTIS HC $3.75

After a comparison of various types of homopolar motors, a study is presented of a transistor starter for a homopolar motor with disk rotors. A system for regulating angular velocity by a tachometric generator is described, and results of investigations of a small experimental homopolar motor are reported. Transl. by F.O.S.

N75-25056*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUSTAINED ARC IGNITION SYSTEM Patent Application
Arthur G. Birchenough, inventor (to NASA) Filed 3 Jun. 1975 21 p
(NASA-Case-LEW-12444-1; US-Patent-Appl-SN-583485) Avail: NTIS HC $3.25 CSCL 21B

Circuitry for maintaining an arc or spark across a spark gap for a desired length of time is described. A high-voltage, direct-current (dc) source is connected in series with a secondary winding of a high voltage, step-up transformer or coil and a spark gap. The high-voltage source is controlled by a solid state switch which is responsive to a timing device such as a set of ignition contact points or a magnetic pulse generator operating in synchronism with a spark ignition engine. The timing device also provides signals to a current switching circuit which interrupts current flow through a primary winding of the high-voltage coil at the prescribed time that a spark is desired at the spark gap. The control circuit may include both a switch and a multivibrator if the timer is of the pulse-generating magnetic type. NASA

N75-25057*# West Virginia Univ., Morgantown. Dept. of Electrical Engineering.
ANALYSIS AND DESIGN OF AIRCRAFT ANTENNAS Final Report, 1 Mar. 1971 - 30 Jun. 1975
Constantine A. Balanis 30 Jun. 1975 24 p
(Contract NGR-49-001-049)
(NASA-CR-142945) Avail: NTIS HC $3.25 CSCL 09C

Recording systems and other associated electronic equipment were engineered, calibrated, and used to measure antenna radiation patterns of aircraft structures. Antenna design, measured and computed results, and performance are discussed. Data show measured and computer data to be in agreement. E.H.W.

N75-25058*# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
NETWORK SYNTHESIS
R. W. Brockett Jan. 1975 79 p refs
(Grant NGR-22-007-172)
(NASA-CR-121171) Avail: NTIS HC $4.75 CSCL 09C

A discussion, with numerous examples, on the application of state variable methods to network analysis and synthesis is reported. The state variable point of view is useful in the design of control circuits for regulators because, unlike frequency domain methods, it is applicable to linear and nonlinear problems. The reported are intended as an introduction to this theory. Author

N75-25059*# Brown Univ., Providence, R.I. Div. of Engineering.
SUMMARY OF THEORETICAL AND EXPERIMENTAL INVESTIGATION OF GRATING TYPE, SILICON PHOTOVOLTAIC CELLS
L. Y. Chen and J. J. Loferski Jun. 1975 81 p refs
(Grant NGR-40-002-093)
(NASA-CR-142942) Avail: NTIS HC $4.75 CSCL 09C

Theoretical and experimental aspects are summarized for single crystal, silicon photovoltaic devices made by forming a grating pattern of p/n junctions on the light receiving surface of the base crystal. Based on the general semiconductor equations, a mathematical description is presented for the photovoltaic properties of such grating-like structures in a two dimensional form. The resulting second order elliptical equation is solved by computer modeling to give solutions for various, reasonable, initial values of bulk resistivity, excess carrier concentration, and surface recombination velocity. The validity of the computer model is established by comparison with p/n devices produced by alloying an aluminum grating pattern into the surface of n-type silicon wafers. Current voltage characteristics and spectral response curves are presented for cells of this type constructed on wafers of different resistivities and orientations. Author

N75-25060*# Ohio Univ., Athens. Dept. of Electrical Engineering.
A SIMULATION ANALYSIS OF PHASE PROCESSING CIRCUITRY IN THE OHIO UNIVERSITY OMEGA RECEIVER PROTOTYPE
R. A. Palkovic Jun. 1975 54 p refs
(Grant NGR-36-009-017)
(NASA-CR-142943; TM-15) Avail: NTIS HC $4.25 CSCL 09C

A FORTRAN IV simulation study of the all-digital phase-processing circuitry is described. A digital phase-lock loop (DPLL) forms the heart of the Omega navigation receiver prototype, and through the DPLL, the phase of the 10.2 KHz Omega signal was estimated when the true signal phase is contaminated with noise. The DPLL uses a frequency synthesizer as the reference oscillator. The synthesizer is composed of synchronous rate multipliers (SRM's) driven by a temperature-compensated crystal oscillator, and the use of the SRM's in this application introduces phase jitter which degrades system performance. Simulation of the frequency synthesizer discussed was to analyze the circuits on a bit-by-bit level in order to evaluate the overall design, to see easily the effects of proposed design changes prior to actual breadboarding, to determine the optimum integration time for the DPLL in an environment typical of general aviation conditions, and to quantify the phase error introduced by the SRM synthesizer and examine its effect on the system. Author

N75-25061# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
FABRICATION OF MICROMETER LINE WIDTH SAW FILTERS USING DIRECT OPTICAL PROJECTION
W. J. Kearns and A. J. Slobodnik, Jr. 28 Jan. 1975 10 p refs
(AF Proj. 634B)
(AD-A008488; AFCRL-TR-75-0055; AFCRL-IP-225) Avail: NTIS CSCL 09/5

Projection printing directly on acoustic substrates using a 10X master and a high resolution 10:1 reduction lens in conjunction with the photoresist stripping technique has resulted in successful fabrication of micrometer line-width SAW filters, which are used in command, control, and communications and electronic sensing applications. This system and a typical 320 MHz (1.26 micrometer line width) SAW filter are described in detail. GRA

N75-25062# Raytheon Co., Waltham, Mass. Special Microwave Devices.
A 3db HYBRID COUPLER AND 90 DEGREE NON-RECIPROCAL PHASE SHIFTER WITH DRIVER
1 Apr. 1975 49 p
(Contract N00014-74-C-0183)
(AD-A008516) Avail: NTIS CSCL 09/5

The report describes a latching, wideband, high power, 90 degree ferrite phase shifter in Ku-band and a 3db Hybrid Coupler. GRA

N75-25063# McDonnell Aircraft Co., St. Louis, Mo.
INTRASYSTEM ELECTROMAGNETIC COMPATIBILITY ANALYSIS PROGRAM. VOLUME 2: USER'S MANUAL USAGE SECTION Final Report, 19 May 1972 - 19 Nov. 1973
J. L. Bogdanor, R. A. Pearlman, and M. D. Siegel Dec. 1974 191 p 3 Vol.
(Contract F30602-72-C-0277)
(AD-A008527; RADC-TR-74-342-Vol-2) Avail: NTIS CSCL 09/3

The volume, the Usage Section, contains detailed instructions for usage of IEMCAP. A complete description of the input data requirements, formats, and rules for applying them are given. Instructions are also given for data setup and program execution for the various analysis tasks. Sample outputs are presented and described to aid in interpretation of analysis results. An example run is also presented in which a typical system is analyzed. This shows how engineering data is converted into the IEMCAP input format and gives samples from the resulting computer output. Three appendices are provided. The first describes test methods for use with the computer-generated EMC specification limits along with an example. The second appendix describes a separate merge utility program. This program performs supplemental data file management which consolidates two files. The third appendix describes the usage of another separate program which provides supplemental intermodulation frequency analysis. GRA

N75-25064# McDonnell Aircraft Co., St. Louis, Mo.
INTRASYSTEM ELECTROMAGNETIC COMPATIBILITY ANALYSIS PROGRAM. VOLUME 3: COMPUTER PROGRAM DOCUMENTATION Final Report, 19 May 1972 - 19 Nov. 1973
J. L. Bogdanor, C. E. Clark, R. A. Pearlman, R. E. Plummer, and C. D. Skouby Dec. 1974 353 p refs 4 Vol.
(Contract F30602-72-C-0277)
(AD-A008528; RADC-TR-74-342-Vol-3) Avail: NTIS CSCL 09/3

The report documents the programming details of IEMCAP. It contains detailed descriptions of all subroutines, variables, and constants used in the program. IEMCAP is a USA Standard FORTRAN program for computer-aided implementation of electromagnetic compatibility (EMC) at all stages of an Air Force system's life cycle, applicable to aircraft systems, spacecraft and missile systems, and ground-based systems. Extensive knowledge of computers is not required to use the program, and all inputs are in easy-to-use, free-field format. The program incorporates analytical math models to perform four analysis tasks: generation of EMC specification limits tailored to a specific system, analysis for granting waivers to the specifications, survey of the system for interference, and comparative analysis to aid in trade-off decisions. Math models are included covering a large number of source signal waveforms and RF modulation types, receptor types, and transfer modes between sources and receptors. Models are also included for effects of environmental electromagnetic fields. GRA

N75-25065# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ADVANCED ELECTRONIC TECHNOLOGY Quarterly Technical Summary, 1 Nov. 1974 - 31 Jan. 1975
Melvin A. Herlin and Alan L. McWhorter 15 Feb. 1975 20 p refs
(Contract F19628-73-C-0002; AF Proj. 649L)
(AD-A008503; ESD-TR-75-115) Avail: NTIS CSCL 09/1

The following topics are discussed: (1) introduction, applications, integrated circuit processing, analysis and testing for digital computers; (2) reports on advanced electronic technology for computer systems; and (3) quantum electronics, materials, and microelectronics for solid state device research. G.G.

N75-25066# Universal Computer Applications, Palo Alto, Calif.
RADIAL BEAM TWT LARGE SIGNAL ANALYSIS Semiannual Technical Report, 15 May - 15 Nov. 1974
Gerald P. Kooyers and Elden K. Shaw Feb. 1974 54 p refs
(Contract DAAB07-74-C-0377)
(AD-A008047; ECOM-74-0377-1) Avail: NTIS CSCL 09/1

The first semi-annual report is made of a computer aided study to develop a large signal analysis of the equiangular spiral amplifier also called the Radial Beam Traveling Wave Tube (RBTWT). Mathematical descriptions of the model for computer analysis is given. Results of spiral circuit analysis, special circuit dispersion characteristics for higher order modes and a tape approximation spiral circuit analysis are presented. GRA

N75-25067# New Mexico State Univ., University Park. Physical Science Lab.
PRINTED CIRCUIT QUADRALOOP ANTENNA Report for Nov. 1973 - Nov. 1974
Alexander Waterman and Dennis G. Henry Nov. 1974 21 p
(Contract F19628-72-C-0065; AF Proj. 7659)
(AD-A007971; AFCRL-TR-75-0079; PSL-PP00810; SR-2) Avail: NTIS CSCL 09/5

The major development goals for this antenna were mainly mechanical. The antenna was to be light weight and flush mounted. Physical size was to be kept at a practical minimum, and the antenna was to operate in the 400 MHz frequency range. GRA

N75-25068# General Electric Co., Syracuse, N.Y. Research and Development.
APPLICATION MANUAL FOR 200 AMPERE GATE TURNOFF THYRISTOR GTO OR GATE CONTROLLED SWITCH GCS Final Report, Aug. 1973 - Sep. 1974
R. N. Bushman, F. B. Golden, B. W. Merchant, H. Ruhl, and P. Shafer Sep. 1974 193 p refs Prepared in cooperation with General Electric, Auburn, N.Y.
(Contract F33615-71-C-1729)
(AD-A008004; SRD-74-132; AFAPL-TR-74-112) Avail: NTIS CSCL 09/1

The objectives of the Phase I activity were to design, fabricate, and evaluate a gate turnoff thyristor (GTO) with 75-ampere rms minimum rating capable of interrupting a forward current of at least 200 amperes and a braking capability of 1000 volts. The secondary objective was simultaneous reduction of forward drop from 3 to 2 volts. The objectives of Phase II in general have been to further evaluate the GTO device and to provide a technical manual containing data covering theoretical details of device construction and characterization, methods of application, circuit examples for application, and projections covering manufacturing, reliability, and growth. GRA

N75-25069# California Univ., Los Angeles. School of Engineering and Applied Science.
LONG TERM MEMORY IN JUNCTION DEVICES USING MULTIVALENT TRAPPING IMPURITIES IN SILICON Semiannual Report, 1 Mar. - 30 Aug. 1974
J. W. Holm-Kennedy Jan. 1975 72 p refs
(Contract DAAB07-73-C-0306; DA Proj. 1S7-62705-AH-94)
(AD-A008045; UCLA-ENG-7511; ECOM-73-0306-2) Avail: NTIS CSCL 09/1

Various multivalent dopants were investigated with the goal of obtaining non-volatile multilevel memory devices in silicon using the Field Induced Trapping (FIT) effect. The test structures included P-N junctions, Schottky diodes, and resistive bars fabricated in silicon substrates suitably doped with multivalent dopants. Novel device effects were observed and are described. Suitability of various dopants was determined. GRA

N75-25070# Avantek, Inc., Santa Clara, Calif.
PRODUCTION ENGINEERING MEASURE FOR MICROWAVE TRANSISTORS USING PROTON ENHANCED DIFFUSION TECHNOLOGY Quarterly Report, 1 Jan. - 1 Apr. 1974
Harry F. Cooke Apr. 1974 117 p
(Contract DAAB05-73-C-2061)
(AD-A008049; A-74-03; QR-3) Avail: NTIS CSCL 09/1

The purpose is to establish capability of manufacturing microwave transistors using proton enhanced diffusion technology on a production basis. Four types of transistors are to be manufactured; the principle distinguishing factor of the transistor types is the frequency of characterization. During the period, reporting the engineering phase of the contract was completed with the delivery of the third and last engineering sample. Other work has been directed to preparation for the First Article run, including putting together a Test Plan, Reliability testing, and PED process final optimization. GRA

N75-25071# Anderson Labs., Inc., Bloomfield, Conn.
A MICROWAVE SURFACE ACOUSTIC WAVE DISPERSIVE IMCON Final Report, Apr. 1972 - Nov. 1973
T. A. Martin, R. B. Ducharme, and R. L. Sawin Dec. 1974 94 p refs
(Contract F19628-72-C-0309; AF Proj. 5635)
(AD-A007974; AFCRL-TR-74-0622) Avail: NTIS CSCL 09/1

A program was undertaken to design, fabricate, and test a prototype microwave Surface Acoustic Wave (SAW) IMCON which is a wide-band dispersive delay line suitable for pulse compression and micro-scan receiver applications. Described in the report are the analyses and practical constraints which determined the design of the: IMCON Grating, Grating Mode Converter, ZnO Transducers, and Material/Orientation. Fabrication details are discussed for the: Substrates, Fixturing, Photolithography, Sputter Etching, ZnO Sputtering, and Packaging. Experiment results are presented for Grating Mode Converters operating at 30MHz, a SAW-IMCON operating at 60MHz, and the 1000MHz SAW-IMCON. GRA

N75-25072# Texas Instruments, Inc., Dallas.
PRODUCTION ENGINEERING MEASURE FOR AN INTEGRATED POWER SWITCH (IPS) Quarterly Report, 18 Oct. 1974 - 17 Jan. 1975
Bill H. Terrell Feb. 1975 54 p
(Contract DAAB05-73-C-2063)
(AD-A008442; TI-03-75-06; QR-7) Avail: NTIS CSCL 09/5

This Seventh quarterly report covers the effort expended and performance achieved in the seventh quarterly period of a two-year contract. Included are a general technical description and a discussion of potential uses for the Integrated Power Switch (IPS). GRA

N75-25073# Naval Research Lab., Washington, D.C.
BROADBAND FERRITE TOROIDAL PHASE SHIFTER Interim Memorandum Report
M. L. Reuss, Jr. Mar. 1975 23 p ref
(NRL Proj. R08-36; XF54545007)
(AD-A008543; NRL-MR-3011) Avail: NTIS CSCL 09/5

There are applications requiring nonreciprocal phase shifters with flat differential phase shift over waveguide bandwidths. The report covers the development of a X Band phaser operating over the 8.2 to 12.4 GHz bandwidth of RG 52/U waveguide. The principal emphasis is placed on the matching procedure employed since computer analysis of techniques for determining phaser dimensions for flat differential phase shift are well developed. GRA

N75-25074# Naval Research Lab., Washington, D.C.
ANALYSIS OF HALL EFFECT INDUCTIVE SWITCHING
Peter J. Turchi Mar. 1975 25 p
(AD-A008550; NRL-3007) Avail: NTIS CSCL 10/3

The note considers the use of Hall active resistive elements as opening switches for inductive energy systems. Normalized switching waveforms are derived for various modes of operation and simple scaling relations are indicated. GRA

N75-25075# Hughes Aircraft Co., Carlsbad, Calif. Industrial Products Div.
STORAGE CAMERA-TUBE WITH NON-DESTRUCTIVE READOUT Final Report, 1 Jul. 1973 - 30 Sep. 1974
L. S. Yaggy Dec. 1974 38 p
(Contract DAAB07-73-C-0330; DA Proj. 1S7-62705-AH-94-2D)
(AD-A008447; ECOM-73-0330-F) Avail: NTIS CSCL 09/1

The report describes the progress and reviews accomplishments on major tasks to develop a novel storage camera-tube. The tube is capable of dual-mode operation, either as a real-time television camera-tube or as a storage camera-tube with non-destructive readout, switchable on command. Details of the device are described, and test results are presented. A sensitivity of .055 amperes per watt at 1.06 micrometer wavelength was achieved, representing 6 1/2% quantum efficiency. Means of increasing 1.06 micrometer sensitivity are discussed. GRA

N75-25076# Hughes Aircraft Co., Culver City, Calif. Display Systems and Human Factors Dept.
BREADBOARD HIGHLY RELIABLE VERTICAL TV DISPLAY SYSTEM, PHASE 2 Final Report, 15 Mar. - 15 Dec. 1974
G. Wolfson and B. W. Keller Feb. 1975 96 p
(Contract N62269-74-C-0342)
(AD-A008241; HAC-P75-44R; HAC-Ref-D2143) Avail: NTIS CSCL 09/5

The tasks performed were two-fold. First, a state-of-the-art CRT was evaluated in an effort to validate the CRT life model, developed during Phase II, and to relate CRT performance to reliability. The second task was the development and fabrication of key elements of the programmable symbol generation with the objective of providing improved performance and reliability. These key elements included the field refresh memory, memory input format logic, memory output format logic, post processor and master timing and control. The effort expended in the development of these key elements has resulted in significant achievements which should lead to both increased symbol generator performance and reliability. GRA

N75-25077# Army Foreign Science and Technology Center, Charlottesville, Va.
EFFECT OF COMPRESSION FACTOR ON SERVICE LIFE OF POWER CAPACITORS
D. S. Varshavskii 22 Mar. 1974 10 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Elektromekhan. (Novocherkassk), no. 3, 1971 p 328-331
(AD-A008249; FSTC-HT-23-1870-73) Avail: NTIS CSCL 09/1

The compression factor K, characterizing the compression of capacitor dielectric, affects the service life of power capacitors in terms of changes in mean electric field strength and actual dielectric thickness. Power capacitor service life is also affected, with a net adverse result, when there is a marked difference between the dielectric permeabilities of cellulose and the impregnant. GRA

N75-25078# Sperry Rand Research Center, Sudbury, Mass.
INTEGRATED SURFACE ACOUSTIC WAVE CONVOLVER/AMPLIFIER Interim Report, 6 May - 6 Dec. 1974
Leland P. Solie Mar. 1975 24 p refs
(Contract F30602-74-C-0270; AF Proj. 5573)
(AD-A008520; SCRC-CR-74-9; RADC-TR-75-57) Avail: NTIS CSCL 09/5

A number of surface acoustic wave convolvers with bidirectional amplification were constructed. These devices use YZ LiNbO3 for the piezoelectric substrate with a semiconducting film overlay of CdSe. Input frequencies of 123 MHz and 132 MHz are used with a convolution output frequency of 255 MHz. The interaction region of all constructed devices has been 5 microseconds. A convolution efficiency of -12 dBm has been obtained. The bias voltage for the surface wave amplification ranges from 30 to 70 V and may be applied dc (100% duty cycle). A new set of masks has been designed which should significantly reduce spurious output signals due to reflection of the surface waves. The time duration of this convolver is 10 microseconds. The new designs feature unidirectional input transducers, unidirectional surface wave amplifiers, and split convolution regions for suppression of surface wave echoes.
GRA

N75-25079# Polytechnic Inst. of New York, Farmingdale. Dept. of Electrical Engineering and Electrophysics.
EIGENMODES, QUASIMODES, AND QUASIPARTICLES
N. Marcuvitz Mar. 1975 33 p refs
(Contract N00014-67-A-0438-0016)
(AD-A008413; POLY-EE/EP-75-147) Avail: NTIS CSCL 20/14

A general linear field supports both a discrete and continuous spectrum of modes or source-free field solutions. Although only eigenmodes are necessary for a complete representation of fields excited by sources, noneigen discrete modes (quasimodes) provide a useful and rapidly convergent alternative to the continuum eigenmode part of a field representation. Quasimode field representations, and their interpretation in terms of quasiparticles, are discussed both generally and for the special case of a vector electron plasma field, for which the complete set of eigenmodes is found via a resolvent or characteristic Green's function method.
GRA

N75-25080# Black and Veatch Consulting Engineers, Kansas City, Mo.
PROTECTION INSTRUCTIONS, EMP/RFI PROTECTION INFORMATION USAEDH HARDNESS PROGRAM EMP, SAFEGUARD GROUND FACILITIES GRAND FORKS, VOLUME 1
Dec. 1974 188 p refs
(Contract DACA87-74-C-0012)
(AD-A007911; HNDDSP-72-145-ED-R-Vol-1) Avail: NTIS CSCL 09/3

Protection instructions covering techniques applicable to the protection of tactical ground facilities from the effects of electromagnetic pulse (EMP) resulting from a nuclear explosion, and from radio frequency interference (RFI) generated by plant equipment or by external sources are presented. The protection instructions are based on the most recent authoritative data on EMP/RFI environment.
GRA

N75-25081# Minnesota Univ., Minneapolis. Heat Transfer Div.
ARC CONSTRUCTION AND ANODE HEAT TRANSFER IN HIGH INTENSITY ARCS Final Report, 1 Apr. 1972 - 28 Feb. 1974
J. L. Smith, J. Schafer, and E. Pfender Oct. 1974 57 p refs
(Contract F33615-72-C-1869; AF Proj. 7073)
(AD-A008176; ARL-74-0116) Avail: NTIS CSCL 20/3

A new method has been developed for measuring anode heat fluxes in pulsed kiloampere arcs. The method is based on an optical measurement of the temperature history of the rear face of a very thin anode. Matching of experimental with calculated temperature histories for various front surface heat fluxes provides actual quasisteady anode heat fluxes. Results are presented for tungsten and copper anodes in combination with argon and nitrogen as working gases. Anode heat fluxes are primarily influenced by the cathode condition and the working gas. The second part of this report deals with the anode region of a high intensity arc.
GRA

N75-25082# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
FORCED COOLING OF UNDERGROUND ELECTRIC POWER TRANSMISSION LINES. PART 1: COOLING OF UNDERGROUND TRANSMISSION LINES; HEAT TRANSFER MEASUREMENTS Yearly Report
Robert A. Slutz, William P. Orchard, Leon R. Glicksman, and Warren M. Rohsenow Jan. 1974 33 p refs Prepared in cooperation with Consolidated Edison Co. of New York, Inc.
(PB-239305/6; MIT-EL-74-003-Pt-1; Rept-80619-87) Avail: NTIS HC $3.75; HC also available in a set of 4 reports as PB-239304-SET HC $19.00 CSCL 09A

The heat dissipated in the conductor of a forced cooled pipe type cable must pass through two thermal resistances in series: the conduction resistance of the cable insulation, and the convection resistance due to forced and natural convection from the cable surface to the oil. The upper limit to the convection resistance was determined by natural convection heat transfer tests on a full scale model of a pipe type cable system. It was found that conduction resistance is more than four times larger than convection resistance from cables designed for 138 kv and higher voltages. To accurately predict the temperature inside the cable for a given oil temperature and current, a precise prediction of convection heat transfer is necessary.
GRA

N75-25083# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
FORCED COOLING OF UNDERGROUND ELECTRIC POWER TRANSMISSION LINES. PART 2: HEAT CONDUCTION IN THE CABLE INSULATION OF FORCE-COOLED UNDERGROUND ELECTRICAL POWER TRANSMISSION SYSTEMS Yearly Report
Joel V. Sanders, Leon R. Glicksman, and Warren M. Rohsenow May 1974 240 p refs Prepared in cooperation with Consolidated Edison Co. of New York, Inc.
(PB-239306/4; MIT-EL-74-004-Pt-2; Rept-80619-88) Avail: NTIS HC $7.50; HC also available in a set of 4 reports as PB-239304-SET HC $19.00 CSCL 09A

Forced-cooled systems for oil-filled pipe-type cable circuits are considered. In such systems the conduction resistance through the paper insulation of the cables is the limiting thermal resistance. Assuming bilateral symmetry, steady-state conditions, and two-dimensional heat transfer, a FORTRAN IV computer program was written to solve the heat conduction problem in the cable insulation for arbitrary configurations of a three-cable system. For a steel pipe, a cable system is most susceptible to overheating in the equilateral configuration with the three cables touching. Proximity effects are significant in forced cooling, especially when cables are not provided with a copper tape under the insulation moisture seal assembly.
GRA

N75-25084# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
FORCED COOLING OF UNDERGROUND ELECTRIC POWER TRANSMISSION LINES. PART 3: THE PREDICTION OF FRICTION FACTORS IN TURBULENT FLOW FOR AN UNDERGROUND FORCED COOLED PIPE-TYPE ELECTRICAL TRANSMISSION CABLE SYSTEM Yearly Report
Joseph W. Beckenbach, Jr., Leon R. Glicksman, and Warren M. Rohsenow Sep. 1974 111 p refs Prepared in cooperation with Consolidated Edison Co. of New York, Inc.
(PB-239307/2; MIT-EL-74-005-Pt-3; MIT-HTL-80619-89) Avail: NTIS HC $5.25; also available in a set of 4 reports as PB-239304-SET HC $19.00 CSCL 09A

Forced cooled systems for underground, oil filled, pipe-type electrical transmission cable systems are described. Electrical transmission cables in an oil filled conduit are wrapped with a semi-circular, protective skid wire, which increases the turbulence in the flow. An equation was used which correlates the friction factor of the rough surface and combines the effects of the rough and smooth surface on the flow to obtain friction factor vs. Reynolds number plot for the entire pipe-type cable system. This theory was written in the form of a FORTRAN IV computer program. It accepts as input the geometrical dimensions of a system and yields as output the friction and corresponding Reynolds number for the entire pipe-type cable geometry. The results predicted from the theory are consistently 15-30 percent above the experimentally determined values.
GRA

N75-25085# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
FORCED COOLING OF UNDERGROUND ELECTRIC POWER

TRANSMISSION LINES. PART 4: ANALYSIS OF PUMPING SYSTEMS FOR THE COOLING OF UNDERGROUND TRANSMISSION LINES Yearly Report
Paul F. Koci, Leon R. Glicksman, and Warren M. Rohsenow Aug. 1974 152 p refs Prepared in cooperation with Consolidated Edison Co. of New York, Inc.
(PB-239308/0; MIT-EL-74-006-Pt-4; MIT-HTL-80619-90) Avail: NTIS HC $6.25; HC also available in a set of 4 reports as PB-239305-SET HC $19.00 CSCL 09A

Various pumping arrangements and their pressure profile control for forced cooling of long pipe type transmission lines were investigated. The system was separated into a number of units where the oil flow direction alternated from unit to unit. Experimentally and analytically it was determined that pump systems operating as constant flow sources are superior to constant pressure sources, and that the even-number-of-units configuration was the best solution when operated with a single pressure control head tank. The simplest line pressure profile control appeared to be the pump bypass; the head tank pressure adjustment was the most effective line pressure profile control scheme. GRA

N75-24977 Joint Publications Research Service, Arlington, Va.
CHOICE OF A CIRCUIT OF LOW-FREQUENCY THIRD-OCTAVE BAND-PASS FILTERS IN CONSIDERATION OF THEIR TRANSIENT TIME
A. M. Ler and M. N. Pedanich *In its* Signal Selection and Transmission (JPRS-64817) 21 May 1975 p 28-33 refs Transl. into ENGLISH from Otbor i Peredacha Informatsii (Kiev), no. 25, 1970 p 109-113 (For availability see N75-24973 16-31)

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N75-25086 British Library Lending Div., Boston Spa (England).
THE ROLE OF THERMAL CONTACT RESISTANCE IN HEAT TRANSFER FROM A LIQUID METAL IN A ROUND TUBE
P. L. Kirillov 25 Jul. 1974 16 p refs Transl. into ENGLISH from Russian report FEI-284, 1971
(BLL-CE-Trans-6464-(9022.09); FEI-284) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Under static conditions, contact thermal resistance depends on the purity of the liquid metal and of the surface, their thermal conductivities. With a forced flow, thermal resistance on the boundary depends on surface films, on the purity of the metal and on deposition of impurities on the wall. The maximal thermal resistance, which is associated with deposition of impurities on the wall when heating the heat transfer medium, can be assessed from a formula. Author

N75-25087*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CORRELATION BETWEEN THE OUTER FLOW AND THE TURBULENT PRODUCTION IN A BOUNDARY LAYER
William C. Cliff and Virgil A. Sandborn May 1975 12 p refs
(NASA-TM-X-64935) Avail: NTIS HC $3.25 CSCL 20D

Space-time velocity correlation measurements between fluctuations occurring in the convoluting outer edge of a flat boundary layer with fluctuations occurring near the viscous subregion were made. The correlations indicate that information is propagated from the outer region to the inner region. The migration of turbulence away from the wall was previously studied in the open literature. The results presented here along with the migration results lend support to the limit cycle model for turbulence production. Author

N75-25088*# Grumman Aerospace Corp., Bethpage, N.Y.
DEPLOYABLE HEAT PIPE RADIATOR Final Report
F. Edelstein Apr. 1975 115 p refs
(Contract NAS8-29905)
(NASA-CR-143863; DHPR-75-13) Avail: NTIS HC $5.25 CSCL 20M

A 1.2- by 1.8-m variable conductance heat pipe radiator was designed, built, and tested. The radiator has deployment capability and can passively control Freon-21 fluid loop temperatures under varying loads and environments. It consists of six grooved variable conductance heat pipes attached to a 0.032-in. aluminum panel. Heat is supplied to the radiator via a fluid header or a single-fluid flexible heat pipe header. The heat pipe header is an artery design that has a flexible section capable of bending up to 90 degrees. Radiator loads as high as 850 watts were successfully tested. Over a load variation of 200 watts, the outlet temperature of the Freon-21 fluid varied by 7 F. An alternate control system was also investigated which used a variable conductance heat pipe header attached to the heat pipe radiator panel. Author

N75-25089*# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
A STUDY OF TURBULENT FLOW BETWEEN PARALLEL PLATES BY A STATISTICAL METHOD Final Report
R. Srinivasan, D. P. Giddens, L. H. Bansert, and J. C. Wu Jun. 1975 68 p refs
(Grants NGR-11-002-157; NGR-11-002-159)
(NASA-CR-142934) Avail: NTIS HC $4.25 CSCL 20D

Turbulent Couette flow between parallel plates was studied with a statistical mechanics approach. A model equation was used which was similar to the Boltzmann equation of kinetic theory and was proposed by Lundgren for the velocity distribution of fluid elements. Solutions to this equation were obtained numerically, employing the discrete ordinate method and finite differences. Two types of boundary conditions on the distribution function are considered, and the results of the calculations were compared to available experimental data. The research establishes that Lundgren's equation provides a good description of turbulence for the flow situation considered, and that it offers an analytical tool for further study of more complex turbulent flows. Author

N75-25090*# Louisiana State Univ., Baton Rouge. Reacting Fluids Lab.
EVALUATION OF THE ENERGY TRANSFER IN THE CHAR ZONE DURING ABLATION. PART 2: IN-DEPTH RESPONSE OF ABLATIVE COMPOSITES, VOLUME 1 Ph.D. Thesis, 1975. Final Report
Ralph W. Pike and Eduardo Gonzales delValle 15 Dec. 1974 370 p refs 2 Vol.
(Grant NGR-19-001-016)
(NASA-CR-142938) Avail: NTIS HC $10.00 CSCL 20M

The decomposition of ablative composites is described along with the transport phenomena of pyrolysis gases which result from the decomposition of these plastics as they flow through the porous char of char-forming ablators. The pyrolysis products are those formed by the thermal degradation of nylon-phenolic resin and silicone elastomer composites. Emphasis is placed on the nature and extent of chemical reactions of the pyrolysis products and the char, along with the energy absorbed by the combined pyrolysis and char zone. Chemical reactions with thermodynamically consistent kinetic data are determined in order to develop a realistic analysis for predicting the thermal performance of ablative heat shields. Author

N75-25091*# Louisiana State Univ., Baton Rouge. Reacting Fluids Lab.
EVALUATION OF THE ENERGY TRANSFER IN THE CHAR ZONE DURING ABLATION. PART 2: IN-DEPTH RESPONSE OF ABLATIVE COMPOSITES, VOLUME 2 Ph.D. Thesis, 1975. Final report
Ralph W. Pike and Eduardo Gonzales delValle 15 Dec. 1974 350 p refs 2 Vol.
(Grant NGR-19-001-016)
(NASA-CR-142937) Avail: NTIS HC $9.50 CSCL 20M

General analyses implemented in FORTRAN IV for studying the energy transfer in the combined decomposition/char zone of a charring ablator are described. Author

N75-25092*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMBINED RADIATION, CONVECTION, AND CONDUCTION FOR A SYSTEM WITH A PARTIALLY TRANSMITTING WALL

Robert Siegel and Nihad A. Hussain (San Diego State Univ.) Washington Jun. 1975 30 p refs
(NASA-TN-D-7985; E-8150) Avail: NTIS HC $3.75 CSCL 20D

The net radiation method is developed for systems having both opaque and partially transparent walls. Heat convection is present at the surfaces and heat conduction through the windows is taken into account. Specific equations are derived for a window between two parallel plates, where one plate is at an elevated temperature typical of what would be encountered in an electric furnace, and the other plate is being cooled. A two-band model is used with cutoff wavelengths typical of glass or quartz. Numerical results are obtained for the window temperature and the heat flow through the window. The effect on these quantities of various plate temperatures and emissivities is shown. Author

N75-25093*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF FREE-STREAM TURBULENCE ON FILM COOLING

Cecil J. Marek and Robert R. Tacina Washington Jun. 1975 29 p refs
(NASA-TN-D-7958; E-8188) Avail: NTIS HC $3.75 CSCL 20D

Film-cooling experiments were conducted at four levels of free-stream turbulence to test the hypothesis that the film-cooling effectiveness is inversely related to the free-stream turbulence level. The hot-gas operating conditions were held constant at a temperature of 590 K, a pressure of 1 atmosphere, and a velocity of 62 m/sec. The film-cooling air was at ambient inlet temperature, and the film-cooling flow rates were 2.5, 5.0, 7.5, and 10.0 percent of the total airflow. Blockage plates with blockage areas of 0, 52, 72, and 90 percent were placed upstream of the film-cooling slot and produced axial turbulence intensities of 7, 14, 23, and 35 percent, respectively. The film-cooling effectiveness decreased as much as 50 percent as the free-stream turbulence intensity was increased from 7 to 35 percent. The value of the turbulent mixing coefficient used in previous work was compared with the axial turbulence intensity. The turbulent mixing coefficient was found to be 10 to 40 percent of the axial turbulence intensity. Author

N75-25094*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EXTERNAL FINS AND EJECTOR ACTION FOR REDUCING THE INFRARED EMISSION OF ENGINE EXHAUST DUCTING

G. James VanFossen, Jr. Washington Jun. 1975 14 p refs
(NASA-TM-X-3242; E-8238) Avail: NTIS HC $3.25 CSCL 20M

An analytical investigation was conducted to determine the feasibility of using external fins and ejector action on the exhaust ducting of a helicopter to reduce the infrared emission of the aircraft. Temperatures were calculated for both circular disk fins and pin fins. Results show that combining ejector action with fins can lower the metal temperature to acceptable levels at least for high flight speeds. Author

N75-25095*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CALCULATION PROCEDURE FOR TRANSIENT HEAT TRANSFER TO A COOLED PLATE IN A HEATED STREAM WHOSE TEMPERATURE VARIES ARBITRARILY WITH TIME

James Sucec Washington Jun. 1975 24 p refs
(NASA-TM-X-3238; E-8217) Avail: NTIS HC $3.25 CSCL 20M

Solutions for the surface temperature and surface heat flux are found for laminar, constant property, slug flow over a plate convectively cooled from below, when the temperature of the fluid over the plate varies arbitrarily with time at the plate leading edge. A simple technique is presented for handling arbitrary fluid temperature variation with time by approximating it by a sequence of ramps or steps for which exact analytical solutions are available. Author

N75-25096*# Kanner (Leo) Associates, Redwood City, Calif.

THE HODOGRAPH METHOD FOR AXISYMMETRIC NEARSONIC FLOWS OF GAS

Z. N. Dobrovolskaya Washington NASA Jun. 1975 17 p refs Transl. into ENGLISH from Prikl. Matematika i Mekhan. (USSR), v. 39, no. 2, Mar. - Apr. 1975 p 280-289
(Contract NASw-2481)
(NASA-TT-F-16405) Avail: NTIS HC $3.25 CSCL 20D

From an analysis of a uniform, near-sonic gas flow far from a body of rotation which perturbs the flow (in the hodographic plane), an asymptotic expansion of the Legendre potential was obtained. The flow of an ideal gas around a thin body of rotation with a uniform, near-sonic velocity at infinity is discussed along with damping of the perturbations introduced by the body of rotation in a near-sonic flow far upstream from the compression jumps. Since the shock wave equation in hodographic variables becomes known, the asymptote of a transonic, axisymmetric flow was determined in hodographic variables. The investigation was carried out in the framework of an approximate Karman equation for the perturbed velocity potential. An asymptotic expansion of the Legendre potential which has the necessary properties of regularity in the hodographic plane, was obtained. Author

N75-25097*# Techtran Corp., Glen Burnie, Md.

NONLINEAR HYDRODYNAMIC SYSTEMS

F. V. Dolzhanskiy, V. I. Klyatskin, A. M. Obukhov, and M. A. Chusov Washington NASA Jan. 1974 158 p refs Transl. into ENGLISH of the book "Nelineynye sistemy gidrodinamicheskogo tipa" Moscow, Nauka Press, 1974 160 p
(Contract NASw-2485)
(NASA-TT-F-15755) Avail: NTIS HC $6.25 CSCL 20D

The theory of hydrodynamic systems was used for calculating convective processes and cascade transformation of energy in a developed turbulent flow, and for the problem of quantitative evaluation of various types of noises in nonlinear systems which stimulate processes in the atmosphere. General criteria are formulated which are satisfied by models which approximate actual hydrodynamic processes. The equations of the motion of such models, called hydrodynamic systems, possess important properties of the initial system of hydrodynamic equations. The results may be applied toward the theory of simulation of natural hydrodynamic processes, both under laboratory conditions and with the aid of electronic computers. Author

N75-25098*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TURBINE VANE COOLANT FLOW VARIATIONS AND CALCULATED EFFECTS ON METAL TEMPERATURES

Frederick C. Yeh, Peter L. Meitner, and Louis M. Russell Washington Jun. 1975 16 p ref Prepared in cooperation with Army Air Mobility R and D Lab., Cleveland
(NASA-TM-X-3249; E-8254) Avail: NTIS HC $3.25 CSCL 21E

Seventy-two air-cooled turbine vanes were tested to determine coolant flow variations among the vanes. Calculations were made to estimate the effect of measured coolant flow variations on local vane metal temperatures. The calculations were based on the following assumed operating conditions: turbine inlet temperature, 1700 K (2600 F); turbine inlet pressure, 31 N/sq cm (45 psia); coolant inlet temperature, 811 K (1000 F); and total coolant to gas flow ratio, 0.065. Variations of total coolant flow were not large (about 10 percent from the arithmetic mean) for all 72 vanes, but variations in local coolant flows were large. The local coolant flow variations ranged from 8 to 75 percent, and calculated metal temperature variations ranged from 8 to 60 K (15 to 180 F). Author

N75-25099# Missouri Univ., Rolla.

RADIATIVE INTERCHANGE BETWEEN SEMI-INFINITE PARALLEL STRIPS: A SIMPLE TWO-DIMENSIONAL METHOD

D. C. Look and S. E. McKinney 23 May 1975 33 p refs Backup document for AIAA Synoptic scheduled for publication in AIAA Journal in Oct. 1975
Avail: NTIS HC $3.75

A technique of multiple numerical quadrature was used to investigate two dimensional radiative transfer between semi-infinite parallel strips. Parameters of the analyses are discussed in detail, and a series of typical solutions are presented. Author

N75-25100# Sandia Labs., Albuquerque, N.Mex.
STUDY OF IMPINGING AXISYMMETRIC TURBULENT FLOWS, THE WALL JET, THE RADIAL JET, AND OPPOSING FREE JETS Ph.D. Thesis
P. O. Witze Jan. 1975 185 p refs
(Contract AT(29-1)-789)
(SAND-74-8257) Avail: NTIS HC $7.00

The results of an experimental and analytic study of impinging axisymmetric turbulent flows are presented. Three impinging-flow configurations are considered: a single axisymmetric turbulent jet impinging normal to a plate; two directly-opposing axisymmetric turbulent jets of equal momentum flux impinging against each other; and a constrained radial jet as produced by the radial flow from an annular orifice formed by two parallel circular disks. The purpose of the investigation is to characterize the structure of these flows, with the goal of identifying and analytically modeling the regions of physically similar flow behavior. Author (NSA)

N75-25101# United Kingdom Atomic Energy Authority, Risley (England).
USE OF POTENTIAL THEORY IN THE SOLUTION OF COMPRESSIBLE FLOW PROBLEMS
W. D. Collier Oct. 1974 18 p refs
(TRG-Report-2486-R) Avail: ERDA Depository Libraries HC $4.00

Many physical phenomena are described by potential theory and closely allied equations, including nonviscous irrotational incompressible flow. A description is given of how potential theory may be extended to compressible flow and examples of its use are provided. Author (NSA)

N75-25102# California Univ., Livermore. Lawrence Livermore Lab.
COMPUTATION OF SOLUTIONS FOR THE FLOW OF FLUIDS THROUGH POROUS MATERIALS
J. H. Pitts 23 Oct. 1974 8 p refs Presented at CUBE Symp., Livermore, Calif., 23 Oct. 1974 Sponsored by ERDA
(UCRL-76472; Conf-741001-50) Avail: NTIS HC $3.25

Numerical solutions to the partial differential equations covering (1) the flow of an ideal gas, and (2) the flow of a steam and air mixture, through porous materials are presented. Results are applicable to containment problems associated with underground nuclear testing, accident analysis for nuclear power generating stations, and the stimulation of petroleum reservoirs. In each case active fluid is applied under pressure to a boundary of a porous solid (earth) and pressure, temperature, and water saturation are calculated as a function of space and time along with flow rates and the location of the active fluid front. Both one and two-dimensional calculations are presented for the ideal gas case. Results for a steam and air mixture in a one-dimensional Cartesian coordinate system are used to examine the effects of condensation. Author (NSA)

N75-25103# Massachusetts Inst. of Tech., Cambridge. Dept. of Nuclear Engineering.
THERMAL NEUTRON SCATTERING STUDIES OF MOLECULAR DYNAMICS AND CRITICAL PHENOMENA IN FLUIDS Annual Progress Report, Dec. 1973 - Nov. 1974
S. H. Chen 1974 13 p refs
(Contract AT(11-1)-3352)
(COO-3352-6) Avail: NTIS HC $3.25

Progress is reported on coherent and incoherent neutron scattering in dense gases, development of a photon correlation spectrometer for the study of critical phenomena, and theoretical work in the kinetic theory of dense gases. Two significant measurements were made in dense gases. Coherent scattering from nitrogen gas at a range of pressures up to 512 atm was performed at BNL and incoherent scattering from hydrogen gas at pressures up to 2000 atm was done at ANL. A digital correlator in the form of a compact, integrated unit was developed for a computerized photon correlation spectrometer being completed. A digital computer program that is capable of calculating the dynamic structure factor of dense gases corresponding to conditions under which the neutron experiments were done was developed. NSA

N75-25104# Naval Ordnance Lab., White Oak, Md.
ON THE TRANSITIONAL VELOCITIES OF VORTEX RINGS
Dirse W. Sallet 31 Dec. 1974 19 p refs
(AD-A008146; NOLTR-74-209) Avail: NTIS CSCL 20/4

A simplified model for the vortex ring is given. The translational velocity of vortex rings is discussed and predicted velocities are compared with experimentally determined values. GRA

N75-25105# Purdue Univ., Lafayette, Ind. Thermal Sciences and Propulsion Center.
COMPARISON OF TRANSONIC FLOW SOLUTIONS IN C-D NOZZLES Final Report, Sep. 1972 - Aug. 1974
Robert J. Mary, Jr., H. Doyle Thompson, and Joe D. Hoffman Oct. 1974 99 p refs
(Contract F33615-73-C-2010; AF Proj. 3012)
(AD-A008003; AFAPL-TR-74-110) Avail: NTIS CSCL 20/4

The method of characteristics has proven to be a highly accurate and relatively straight forward technique for computing the supersonic flow field in a two-dimensional or axisymmetric nozzle. However, the method of characteristics requires an initial value line traversing the flow in the fully supersonic region on which the flow properties are known. A parametric study of the effect of different transonic flow calculation methods for establishing the initial value line for axisymmetric converging-diverging nozzles was conducted. The Mach number and radial velocity distributions along a reference start line were calculated and compared for several different transonic solutions for a series of nozzles with different throat radii of curvature. These initial value lines were then used to initiate a method of characteristics analysis of several geometrically different axisymmetric nozzles in order to investigate the impact on calculated performance. GRA

N75-25106# General Motors Corp., Indianapolis, Ind. Detroit Diesel Allison Div.
EVALUATION OF A FLUIDIC TEMPERATURE SENSOR/AIR EJECTOR ASSEMBLY Final Report, 15 Jul. 1973 - 30 Apr. 1974
J. E. Whicker Nov. 1974 118 p refs
(Contract F33657-73-C-0618; AF Proj. 3066)
(AD-A007978; DDA-EDR-8137; AFAPL-TR-74-58) Avail: NTIS CSCL 21/5

A fluidic, edgetone resonator sensor designed for gas temperature measurement at the compressor inlet of gas turbine engines was fabricated and evaluated on a burner rig at simulated engine conditions. Tested with the sensor was an air ejector used to lower the sensor back pressure to maintain proper sensor operation (choked flow at the discharge orifices) over the entire range of engine flight conditions. Steady-state performance of the sensor/ejector combination when compared with test thermocouples was acceptable in terms of both accuracy and repeatability. Transient response performance was somewhat less than desired, and subsequent heat transfer analyses revealed the problem areas and identified several likely improvements. Author (GRA)

N75-25107# Naval Ship Research and Development Center, Bethesda, Md.
A NONLINEAR DESIGN THEORY AND METHOD FOR SUPERCAVITATING CASCADES
Bohyun Yim and Laurie M. Higgins Feb. 1975 57 p refs
(SF43421704)
(AD-A008557; NSRDC-4240) Avail: NTIS CSCL 20/4

A nonlinear method for finding two-dimensional supercavitating sections in a cascade is developed. The load distribution is taken from linear theory for low-drag supercavitating foils in a cascade. The double spiral vortex model is used for cavity termination. Linear and nonlinear theories are compared with special emphasis put on analyzing the blunt leading edge. The foil cavity shape, cavity drag, and cavitation number can be obtained by a computer program, when the cavity length and geometrical parameters of the cascade are given. GRA

N75-25108# Naval Ship Research and Development Center, Bethesda, Md.
MANUAL: NSRDC SHIP-MOTION AND SEA-LOAD COMPUTER PROGRAM
W. G. Meyers, D. J. Sheridan, and N. Salvesen Feb. 1975 135 p refs

(AD-A008335; NSRDC-3376) Avail: NTIS CSCL 13/10

A description of the NSRDC Ship-Motion and Sea-Load Computer Program is presented. This program computes the six-degree-of-freedom ship motions, wave-induced loads and pressure distribution for a ship advancing at constant speed with arbitrary heading in regular waves. Program organization and structure, data card input and output format are described. A sample computational problem is included to aid in understanding input and output format and to provide a test for proper implementation. A listing of the program, as used on the CDC-6700 computer system at NSRDC, is included. GRA

N75-25109# Army Foreign Science and Technology Center, Charlottesville, Va.

TEMPERATURE DISTRIBUTION IN THE GENERATOR OF A SOLAR REFRIGERATOR AND THE THERMAL CONDUCTIVITY OF THE ADSORBENT

O. Shadyev and G. Ya. Umarov 22 Mar. 1974 9 p refs Transl. into ENGLISH from Geliotekhnika, Akad. Nauk Uz. SSR (Tashkent), no. 5, 1972 p 34-37

(AD-A008266; FSTC-HT-23-1880-73) Avail: NTIS CSCL 07/4

The thermal conductivity of an adsorbent, octoammiacate, CaCl2-8NH3, used in a periodic-action adsorption solar refrigerator is analyzed. Also presented is the temperature distribution in the generator of the solar refrigerator. GRA

N75-25110# Naval Ship Research and Development Center, Bethesda, Md.

A REVIEW OF SLIP FLOW IN CONTINUUM PHYSICS

Hans J. Lugt and Joanna W. Schot Jan. 1975 42 p refs

(AD-A008316; NSRDC-4614) Avail: NTIS CSCL 20/4

In the study of fluid-solid surface interactions the concept of slip of a fluid at a solid wall serves to describe macroscopic effects of certain molecular phenomena. Macroscopic slip may be divided into the following two types: (1) Real slip, for which molecular interactions cause slip to take place in the bulk fluid, such as in the rarefied gas regime; in flows through minute capillaries and porous media at atmospheric pressures if the dimensions of the pores are comparable to the molecular mean free path of the gas; in certain non-Newtonian fluids; and in mass diffusion theory. (2) Pseudo slip, which corresponds to the use of fictitious slip conditions to obtain useful models for complicated flow problems, such as those involving suspensions and liquid flows over permeable material and grooved plates. GRA

N75-25111# Duvvuri Research Associates, Chula Vista, Calif.

THEORETICAL STUDY OF TURBULENT MIXING ALONG CURVED JET BOUNDARIES Interim Technical Report, 21 May 1973 - 21 Mar. 1974

Tirumalesa Duvvuri and Boray S. Raghunath Feb. 1975 78 p refs

(Contract F33615-73-C-4120; AF Proj. 7116)

(AD-A008192; DRA-TR-74-02; ARL-75-0017; ITR-2) Avail: NTIS CSCL 20/4

The problem of the turbulent mixing along the curved boundaries of a jet has been analyzed for an incompressible plane flow. The initial and fully developed regions of the curved mixing zone are analyzed with Tollmien and Goertler eddy viscosity models. It is shown that similarity solutions exist under certain conditions. A perturbation analysis is carried out to include the first order effects of curvature and growth of mixing zone. Comparison is made of the results of the numerical computation with the two eddy viscosity models. A parametric study of different centerline velocity decay rates and the external pressure gradient is made in the fully developed region. GRA

N75-25112# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INFLUENCE OF A SINUSOIDAL WALL DISTURBANCE ON THE TRANSITION

P. Gougat and J. J. Perrin 19 Feb. 1975 46 p refs Transl. into ENGLISH from proceedings of the Assoc. Franc. des Ingr. Tech. d'Laeronautique et de l'Espace, Colloq. d'Aerodynamique Appl., 7th, Modane, France, 4-6 Nov. 1970 p 1-47

(AD-A007927; FTD-HC-23-0859-75) Avail: NTIS CSCL 20/4

The influence of wall roughness on laminar boundary transition and harmonic disturbance was examined. Data are given on: pulsed external flows or external acoustic generators, partial injection of secondary gas in continuous or pulsed flew, and wall disturbance produced by harmonic roughness or by harmonic vibration of the wall. Various undulated plates were used for the study. Author

N75-25113# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THEORY FOR THE PROPAGATION OF UNDULATING DISTURBANCES UPSTREAM IN A SUBSONIC FREE JET

G. Neuwerth 25 Feb. 1975 59 p refs Transl. into ENGLISH from Deut. Luft- and Raumfahrt Forschungsbericht (West Germany), v. 74, no. 20, 1974 p 1-57

(AD-A007928; FTD-HC-23-0881-75) Avail: NTIS CSCL 20/4

Experimental observations have shown that a periodic pressure disturbance inside a subsonic jet propagates upstream in a way that may be explained as waves traveling obliquely to a jet axis, which are totally reflected at the jet boundary layer. This pressure wave induces axisymmetric ring vortices in the free boundary near the nozzle exit, which intensifies the noise of the jet considerably. A good agreement between the solutions for a clear model representation and the results of the theoretical computation of the propagation of undulating disturbances traveling upstream is found. Outside the jet a near field is induced, and its decrease perpendicular to the jet is computed. GRA

N75-25114# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE MIXING OF NONISOTHERMAL GAS IN A CYLINDRICAL PIPE

I. I. Mezhirov 21 Feb. 1975 17 p Transl. into ENGLISH of Tsentr. Aerogidrodinamicheskii Inst., Uch. Zap. (USSR), v. 1, no. 6, 1970 p 113-116

(AD-A007944; FTD-MT-24-0378-75) Avail: NTIS CSCL 20/4

Applying the laws of thermodynamics, it is shown that the flow of gas is influenced by the nonuniformity of temperature of stagnation near the entrance of the pipe. Gas velocity, energy loss, and output yield are calculated, and it is shown that the nonuniformity of temperature of stagnation always leads to pitot losses of the output yield from a cylindrical pipe. J.R.T.

N75-25115# Washington Univ., Seattle. Aerospace Research Lab.

A VARIATIONAL FORMULATION OF THE COMPRESSIBLE THROUGHFLOW PROBLEM Final Report, Mar. 1973 - Apr. 1974

Gordon C. Oates and Graham F. Carey Aug. 1974 94 p refs

(Contract F33615-73-C-2056; AF Proj. 3066)

(AD-A007979; AFAPL-TR-74-78) Avail: NTIS CSCL 20/4

A variational formulation of the compressible throughflow flow problem is developed. The method is suitable for the calculation of throughflow fields in which large rotational effects, large compressibility effects and large variations in hub and tip radii may exist. The formulation requires the absence of viscous forces between blade rows, though the effects of losses within the blade rows may be included through the variation of entropy across streamsurfaces. The meridional Mach number is restricted to be less than unity, though the complete flow Mach number may be much in excess of unity. The variational formulation represents a complete statement of the problem in that the boundary conditions, far upstream and far downstream conditions, and matching conditions at all actuator discs are all natural conditions of the variational formulation. GRA

N75-25116# Massachusetts Inst. of Tech., Cambridge. Energy Lab.

IMPROVEMENT OF THE ENVIRONMENTAL AND ECONOMIC CHARACTERISTICS OF COOLING TOWERS. PART 1: HEAT REJECTION FROM HORIZONTAL TUBES TO SHALLOW FLUIDIZED BEDS Annual Report

Bruce R. Andeen, Leon R. Glicksman, and Warren M. Rohsenow 30 Jun. 1974 192 p refs Sponsored by Empire State Elec. Energy Res. Corp.

(PB-239440/1; MIT-EL-74-007; Rept-80047-85-Pt-1) Avail: NTIS HC $7.00 CSCL 13A

Existing heat transfer mechanism models for fluidized beds are discussed, and a new model presented. Heat transfer coefficients from a horizontal tube in a row of dummy tubes to a shallow fluidized bed were experimentally measured. The experimental data is compared to existing horizontal tube correlations and the new model. The RMS deviation of data from the model is less than 17%. The best correlation was obtained by modifying the Vreedenberg correlation to include a dependency on the bed particle fraction (RMS deviation: 13.8%). Economic optimizations were performed to compare fluidized bed dry towers to a finned tube tower. For a 1000 Mw plant, heat exchanger costs are 13% lower for fluidized bends, but the cost for the power keeping the bed fluidized yields an incremental cost 16% higher than that for a finned surface. Incremental costs rapidly approach that of finned tubes as the particle size and depth are reduced. GRA

N75-25117# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
IMPROVEMENT OF THE ENVIRONMENTAL AND ECONOMIC CHARACTERISTICS OF COOLING TOWERS. PART 2: THE PERIODIC COOLING TOWER: FLOW VISUALIZATION, SURFACE ROUGHENING, AND FULL SCALE MODEL Annual Report
Pou Cheong Hon, Je-Chin Han, Paul F. Pilger, Leon R. Glicksman, and Warren M. Rohsenow 30 Jun. 1974 106 p refs Sponsored by Empire State Elec. Energy Res. Corp.
(PB-239441/9; MIT-EL-74-008; Rept-80047-85-Pt-2) Avail: NTIS HC $5.25 CSCL 13A

The concept of periodic towers is to have sheet metal discs partially submerged in hot, power condensor effluent. As the discs rotate, they absorb heat from the effluent and discharge heat to the air. The advantages of the periodic tower lie in the low cost of the discs and the ability to operate dry: it is less expensive than a conventional dry tower with finned tubes. When operated wet, the high capacity losses incurred during warm months by dry towers can be eliminated. The periodic tower evaluation includes: (1) the design and construction of a full scale model to test and optimize the overall performance, (2) an analysis of ribbing the disc to enhance air side heat transfer rates, and (3) tests on a scale model for preliminary evaluations of flow conditions for the oil, water, and air. GRA

N75-25118# Princeton Univ., N.J. Gas Dynamics Lab.
FINITE DIFFERENCE SOLUTION OF THE LAMINAR SUPERSONIC NEAR WAKE: A POSTERIORI ERROR STUDY AND PHYSICAL DISCUSSION Interim Report
Bruce B. Ross and Sin-I Cheng Oct. 1974 228 p refs
(Contract F33615-70-C-1244; AF Proj. 7064)
(AD-A008005; PUAMS-1125; ARL-74-0121) Avail: NTIS CSCL 20/4

Solutions of the planar, laminar near wake behind a supersonic rectangular-based body have been obtained using a finite-difference approximation of the full compressible Navier-Stokes equations. Use is made of the basic numerical wake model and finite-difference iteration technique developed by Allen and Cheng. The present study extends this wake model to include a linear variation of viscosity and heat conductivity with temperature, establishes a posteriori: the errors of the numerical solution, and then investigates various physical properties of the wake solutions over a range of flow parameters within the range of validity of the numerical solution. An extensive investigation is made of the sensitivity of the wake solutions to the choice of model configuration and boundary condition treatment with the purpose of determining major error sources and reducing their influence on the wake solutions under the financial constraints of the computational program. GRA

N75-25119# Mitsubishi Heavy-Industries Ltd., Tokyo (Japan).
STUDIES OF HEAT TRANSFER TO AGITATED NON-NEWTONIAN FLUIDS
Yoshio Miyairi Oct. 1974 15 p refs
(PB-239539/0; MTB-94) Avail: NTIS HC $3.25 CSCL 20D

Modified (or apparent) viscosities in heat transfer to agitated nonNewtonian fluids are derived for various flow patterns. The three constant Ellis model is used to characterize the given nonNewtonian fluids. Heat transfer correlation equations are proposed based on these modified viscosities. The experimental studies are carried out with several types of agitators: (1) an agitator with a 2-bladed paddle, (2) an agitator with a helical screw fitted in a draft tube and (3) an agitator with a helical ribbon. The nonNewtonian fluids tested are various concentrations of polymer aqueous solutions of CMC, HEC, PO and SPA. GRA

N75-25120# Iowa Inst. of Hydraulic Research, Iowa City.
A LABORATORY INVESTIGATION OF FREE SURFACE FLOWS OVER WAVY BEDS
Albert F. H. Yuen and John F. Kennedy Dec. 1971 52 p refs
(Contract DI-14-08-0001-11420)
(PB-239627/2; IIHR-121) Avail: NTIS HC $4.25 CSCL 20D

The linearized, third-order analytical model that predicts amplitude ratio and phase shift between bed and surface waves of free surface flows over sinusoidal beds is verified. Agreement between experimental and theoretical results is noted. Near resonance, the surface configuration is found to be complicated by the formation of a hydraulic jump over each bed wave, analyzable only within the framework of a nonlinear model. For selected experiments, the spatial distributions of velocity, total head, bed pressure, and bed shear stress are also measured. The effects of bed curvature on the distributions of these quantities are discussed. GRA

N75-25121# Aeronautical Research Labs., Melbourne (Australia).
WIND TUNNEL STUDIES OF A SHIP MODEL USING VORTEX GENERATORS TO IMPROVE WAKE VELOCITIES
N. Matheson Apr. 1974 46 p refs
(PB-239834/5; ARL/A-347) Avail: NTIS HC $3.75 CSCL 13J

Severe vibration during trials of a 13,000 ton displacement cargo ship was attributed to the propeller working in a strongly non-uniform velocity field. This report gives the results of a series of wind tunnel experiments performed on a reflex model fitted with vortex generators which substantially improved the wake velocity distribution. It was recommended that these generators be geometrically scaled and fitted to the ship in order to improve the wake velocity distribution and reduce the vibration of the ship to an acceptable level. GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N75-25122* National Aeronautics and Space Administration. Pasadena Office, Calif.
HEAT DETECTION AND COMPOSITIONS AND DEVICES THEREFOR Patent
Alan Rembaum, inventor (to NASA) (JPL) Issued 1 Apr. 1975 8 p Filed 20 Jul. 1972 Supersedes N73-20259 (11 - 11, p 1264) Continuation-in-part of US Patent Appl. SN-836280, filed 25 Jun. 1969 Sponsored by NASA
(NASA-Case-NPO-10764-2; US-Patent-3,874,240;
US-Patent-Appl-SN-273519; US-Patent-Class-73-356;
US-Patent-Class-116-114.5; US-Patent-Class-117-72;
US-Patent-Appl-SN-836280) Avail: US Patent Office CSCL 20M

Temperature change of a substrate such as a microelectronic component is sensed and detected by means of a mixture of a weak molecular complex of an electron donor compound such as an organic amine and an electron acceptor compound such as nitroaromatic compound. The mixture is encapsulated in a clear binder such as a vinyl resin.
Official Gazette of the U.S. Patent Office

N75-25123* National Aeronautics and Space Administration. Pasadena Office, Calif.
SERVO-CONTROLLED INTRAVITAL MICROSCOPE SYSTEM Patent

Momtaz N. Mansour (JPL), Harold J. Wayland (JPL), and Carl P. Chapman, inventors (to NASA) (JPL) Issued 13 May 1975 7 p Filed 4 Sep. 1973 Supersedes N74-19093 (12 - 10, p 1173) Sponsored by NASA
(NASA-Case-NPO-13214-1; NASA-Case-NPO-13215-1; US-Patent-3,883,689; US-Patent-Appl-SN-394149; US-Patent-Class-178-7.2; US-Patent-Class-178-DIG.29) Avail: US Patent Office CSCL 14B

A microscope system is described for viewing an area of a living body tissue that is rapidly moving, by maintaining the same area in the field-of-view and in focus. A focus sensing portion of the system includes two video cameras at which the viewed image is projected, one camera being slightly in front of the image plane and the other slightly behind it. A focus sensing circuit for each camera differentiates certain high frequency components of the video signal and then detects them and passes them through a low pass filter, to provide dc focus signal whose magnitudes represent the degree of focus. An error signal equal to the difference between the focus signals, drives a servo that moves the microscope objective so that an in-focus view is delivered to an image viewing/recording camera.
Official Gazette of the U.S. Patent Office

N75-25124* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HOLOGRAPHIC SYSTEM FOR NONDESTRUCTIVE TESTING Patent
Robert L. Kurtz, inventor (to NASA) Issued 13 May 1975 4 p Filed 8 Aug. 1973 Supersedes N73-30478 (11 - 21, p 2554)
(NASA-Case-MFS-21704-1; US-Patent-3,883,215; US-Patent-Appl-SN-386793; US-Patent-Class-350-3.5) Avail: US Patent Office CSCL 14D

A description is given of a holographic system for nondestructive testing. The system is comprised of a mirror which illuminates the test object surface; the mirror is positionable to direct illumination on an object at varying angles with respect to a line normal to the surface of the object. In this manner holograms may be produced with varying degrees of sensitivity enabling optimum observation of dimensions of deformation of an object ockurring between test exposures.
Official Gazette of the U.S. Patent Office

N75-25125 British Broadcasting Corp., Kingswood (England). Research Dept.
ELECTRONIC MASKING FOR TELECINE: A REVIEW OF MASKING FOR POSITIVE AND NEGATIVE FILM
R. P. Marsden May 1975 6 p refs
(BBC-RD-1975/16) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The theory of electronic masking for telecine for use with positive print, negative and reversal films was reviewed. Practical results are discussed and it is concluded that satisfactory results can be obtained for positive print and negative films from the theory of electronic dye masking. Reversal films, because of the magnitude of their interimage effects do not give good results with this type of masking. A satisfactory mask was calculated for reversal film from measurements of the response of a typical telecine to samples of known exposure. Author

N75-25126 British Library Lending Div., Boston Spa (England).
A NEUTRON-INSENSITIVE RADIATION DETECTOR
K. Ewen and B. Gonsior 14 May 1974 14 p refs Transl. into ENGLISH from Nucl. Instr. Methods (Holland), v. 99, 1972 p 573-578
(BLL-CE-Trans-5992-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

A liquid scintillation detector is described, which contains C6F6 as a solvent. This detector has a relatively high gamma-ray efficiency and a very low neutron efficiency. The detector is compared with a NaI detector of the same size. Above a discrimination level of 0.5 MeV the gamma-ray efficiency of the liquid scintillation detector amounts to 25% of that of the NaI detector, whereas the neutron efficiency of the NaI detector is at least 250 times as high as that of the liquid scintillation detector. Author

N75-25127*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HIGH SPEED DATA MONITORING APPARATUS Patent Application
Manfred N. Wirth, inventor (to NASA) Filed 12 May 1975 22 p
(NASA-Case-ARC-10899-1; US-Patent-Appl-SN-576774) Avail: NTIS HC $3.25 CSCL 09B

High speed data monitoring apparatus is described for displaying the bit pattern of a selected portion of a block of transmitted data comprising a shift register for receiving the transmitted data and for temporarily containing the consecutive data bits. A programmable sync detector monitors the contents of the shift register and generates a sync signal when the shift register contains a predetermined sync code. A counter is used for counting the data bits input to the shift register after the sync signal is generated and for generating a count complete signal when a selected number of data bits were input to the register. A data storage device stores the contents of the shift register at the time the count complete signal is generated.
NASA

N75-25128*# Cornell Univ., Ithaca, N.Y. Center for Radiophysics and Space Research.
ERRORS IN HADAMARD SPECTROSCOPY OR IMAGING CAUSED BY IMPERFECT MASKS
Ming Hing Tai, Martin Harwit, and Neil J. A. Sloane (Bell Labs., Murray Hill, N. J.) [1975] 37 p refs
(Grant NGR-33-010-210)
(NASA-CR-142932) Avail: NTIS HC $3.75 CSCL 14B

An analysis is given of the errors in Hadamard spectroscopy that are caused by transparent slits in the mask being systematically wider or else narrower than they should be. It is shown that if the input spectrum consists of a single line, the distorted spectrum that is actually calculated consists of this line, plus four small blips. When the transparent slits are too wide, these blips are of equal height and the same sign, one pair surrounding the line, and another pair displaced a certain distance from it. When the slits are too narrow, the displaced blips have the same amplitude but are negative. Author

N75-25129*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STEERING LAW FOR PARALLEL MOUNTED DOUBLE-GIMBALED CONTROL MOMENT GYROS
H. F. Kennel Feb. 1975 34 p refs
(NASA-TM-X-64930) Avail: NTIS HC $3.75 CSCL 14B

Parallel mounting of double-gimbaled control moment gyros (DG CMG) is discussed in terms of simplification of the steering law. The steering law/parallel mounted DG CMG is considered to be a 'CMG kit' applicable to any space vehicle where the need for DG CMG's has been established. Author

N75-25130*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LASER AND ACOUSTIC DOPPLER TECHNIQUES FOR THE MEASUREMENT OF FLUID VELOCITIES
William C. Cliff May 1975 43 p refs
(NASA-TM-X-64932) Avail: NTIS HC $3.75 CSCL 14B

An overview of current laser and acoustic Doppler techniques is presented. Results obtained by Doppler anemometry and conventional sensors are compared. Comparisons include simultaneous velocity measurements by hot wire and a three-dimensional laser anemometer made in a gaseous pipe flow as well as direct comparisons of atmospheric velocities measured with propeller and cup anemometry. Scanning techniques are also discussed. Conclusions and recommendations for future work are presented. Author

N75-25131# Joint Publications Research Service, Arlington, Va.
PROBABILITY METHODS IN THE APPLIED THEORY OF GYROSCOPES
A. A. Sveshnikov and S. S. Rivkin 14 May 1975 86 p Transl. into ENGLISH from the book "Veroyatnostnyye metody v prikladnoy teorii giroskopov" Moscow, Izd vo Nauka, 1974 p 401-471
(JPRS-64765) Avail: NTIS HC $4.75

Systems of equations are derived for complex gyroscopic systems such as gyroscopic stabilizers, gyroscopic compasses, and inertial navigation systems. The probability characteristics of random quantities or functions were determined on the basis of processing test material (using mathematical statistics). M.J.S.

N75-25132# Electrotechnical Lab., Tokyo (Japan).
IMPROVEMENTS IN SCINTILLATION COUNTER STABILIZATION TECHNIQUE AND ITS APPLICATIONS
Mikio Yamashita Dec. 1974 115 p refs
(Rept-751) Avail: NTIS HC $5.25

Spectrum stabilization techniques for use with scintillation counters based on the counting rate difference feedback are studied with the aim of developing a universal stabilization system which is readily applicable to any type of scintillation detectors. System performance of various types of stabilizers was evaluated using a theoretical approach. A simplified model of the stabilizers is proposed to analyze various stabilizers systematically by using the linear control theory and to define clearly basic parameters affecting the overall performance. The random fluctuations in the system gain due to the very statistical nature in the measurements of counting-rate differences are treated on the statistical control theory for different types of stabilizers operated on either periodic or random reference pulses. The results thus obtained provide a quantitative basis of optimum selection of the basic parameters. Three different types of stabilizers which differ principally in the way of generation of the correction voltage were constructed, and the operating characteristics are experimentally investigated with special interest in line broadening due to counting statistics. The line broadenings measured are found to be in reasonable agreement with theoretical predictions. The use of pulsed light sources to stabilize the counter was also examined. Author

N75-25133# Finnish Meteorological Inst., Helsinki.
DIGITAL ALL-SKY CAMERA
M. Hyppoenen, R. Pellinen, C. Sucksdorff, and R. Torniainen Dec. 1974 30 p refs
(TR-9; ISBN-951-697-039-7) Avail: NTIS HC $3.75

The operation of a digitally controlled all sky camera designed for auroral photography is described. The power supply source is discussed along with the main features of the crystal clock which automatically starts and stops the camera. J.M.S.

N75-25134*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETIC TAPE HEAD FUNCTION SWITCHING SYSTEM Patent Application
Patrick H. Cudmore, inventor (to NASA) Filed 12 May 1975 17 p
(NASA-Case-GSC-11956-1; US-Patent-Appl-SN-576767) Avail: NTIS HC $3.25 CSCL 14B

A magnetic head function switching network for use with high density, bidirectional tape recording systems is disclosed. A first embodiment of the system includes a dedicated erasing head and a pair of recording-reproducing heads, the functions of which may be alternated. A second embodiment of the invention includes a dedicated reproducing head and a pair of recording-erasing heads, the functions of which may be alternated. The system is suitable for use with high density reel-to-reel recorders of the type used in scratch pad memories for computer and similar systems, especially those adapted for use in satellite systems. NASA

N75-25135*# Scientific Translation Service, Santa Barbara, Calif.
DETERMINATION OF THE EFFECTIVENESS OF AIR STERILIZATION FILTERS
G. L. Motina, L. K. Batova, M. G. Gandman, and V. A. Semenyuk Washington NASA Jun. 1975 12 p refs Transl. into ENGLISH from Khim. Farm. Zh. (Moscow), v. 8, no. 10, 1974 p 55-59
(Contract NASw-2483)
(NASA-TT-F-16390) Avail: NTIS HC $3.75 CSCL 14B

A simple filter test for air filters is discussed for industrial applications. Methyl-blue dye aerosol is passed through the filter in the test, and its effective removal by the filter was determined. The distribution of particles by size is given along with the results of testing various industrial filters. Author

N75-25136*# General Electric Co., Philadelphia, Pa. Space Systems Dept.
EUV AND X-RAY SPECTROHELIOGRAPH STUDY Final Report
E. D. Knox, R. A. Pastor, A. L. Salamon, and A. A. Sterk Feb. 1975 106 p
(Contract NAS5-20545)
(NASA-CR-143808) Avail: NTIS HC $5.25 CSCL 14B

The results of a program directed toward the definition of an EUV and X-ray spectroheliograph which has significant performance and operational improvements over the OSO-7 instrument are documented. The program investigated methods of implementing selected changes and incorporated the results of the study into a set of drawings which defines the new instrument. The EUV detector performance degradation observed during the OSO-7 mission was investigated and the most probable cause of the degradation identified. Author

N75-25137*# Technicolor Graphic Services, Inc., Houston, Tex.
APOLLO SOYUZ TEST PROJECT PHOTOGRAPHIC PROCESSING CONTROL PLAN
Harold E. Lockwood May 1975 45 p
(Contract NAS9-11500)
(NASA-CR-141859; JSC-09674) Avail: NTIS HC $3.75 CSCL 14E

The laboratory controls to be used within the photographic technology division (PTD) for processing original space flight films exposed on the Apollo Soyuz Test Project mission are specified. The sensitometric exposures to be used by PTD for certifying processes, for exposing Houston Controls, and for preflight and postflight exposures on original films as well as procedures for film certification are described. Processing conditions used to achieve each control and processing machine operating parameters are included. Author

N75-25138# California Univ., Livermore. Lawrence Livermore Lab.
LLL IMAGE CONVERTED SPECTROGRAPH: INSTRUCTION MANUAL
R. C. Harney 23 Aug. 1972 38 p refs
(Contract W-7405-eng-48)
(UCID-16705) Avail: NTIS HC $3.75

The LLL image converted spectrograph is basically a 1-meter, Littrow type, grating spectrograph equipped with an image converter and camera system. The primary application of the image converted spectrograph is in continuous monitoring of mode locked laser bandwidths. The assembly, operation, and calibration of the spectrograph are described. NSA

N75-25139# Sandia Labs., Albuquerque, N.Mex.
ASYMMETRIC ROTATING MIRROR TURBINE DEVELOPMENT
R. L. Hughes Dec. 1974 20 p refs
(Contract AT(29-1)-789)
(SAND-74-0403) Avail: NTIS HC $3.25

Design considerations, material selection, development and test of an asymmetric high-speed air turbine driven mirror system are described. The conditions for dynamic balance of the mirror head and the effect of residual unbalance are presented. Performance to 8000 revolutions per second was achieved. The system developed offers substantial improvement in performance over the turbines presently in use at Sandia Laboratories in the rotating mirror framing cameras. Author (NSA)

N75-25140# California Univ., Berkeley. Lawrence Berkeley Lab.
EFFECT OF IMPROVING ENERGY RESOLUTION ON GAMMA CAMERA PERFORMANCE: A QUANTITATIVE ANALYSIS
J. Llacer and L. S. Graham Dec. 1974 43 p refs Presented at the Nucl. Sci. Symp., Washington, D. C., 11 Dec. 1974
(Contract W-7405-eng-48)
(LBL-3631; Conf-741213-13) Avail: NTIS HC $3.75

The modulation transfer functions (MTF) of two commercial cameras and of a single element germanium camera fitted with different collimator configuration are studied theoretically and experimentally in order to separate the different elements which contribute to the imaging capabilities of a gamma camera. Effects due to size and shape of collimator holes, and to positron range at 511 keV are treated as filtering functions, predicting the behavior of a camera quite accurately. The effect of energy resolution is studied by noting the changes in MTF and the corresponding changes in the computer generated image of a low contrast circularly symmetric phantom as a function of energy resolution. The possibility of excellent imaging under low contrast situations with high-energy resolution detectors is demonstrated, and the required penalty in camera speed is documented. Author (NSA)

N75-25141# California Univ., Berkeley. Lawrence Berkeley Lab.

CODED APERTURE IMAGING OF GAMMA-RAYS USING MULTIPLE PINHOLE ARRAYS AND MULTIWIRE PROPORTIONAL CHAMBER DETECTOR

L. T. Chang, B. Macdonald, V. Perez-Mendez, and L. Shiraishi Dec. 1974 6 p refs Presented at the Nucl. Sci. Symp., Washington, D. C., 11 Dec. 1974
(Contract W-7405-eng-48)
(LBL-3047; Conf-741213-8) Avail: NTIS HC $3.25

Coded shadows of gamma-ray distributions are made using both random pinhole and nonredundant pinhole coded apertures with a multiwire proportional chamber as detector. Image reconstruction is done optically with incoherent light. Lateral and depth resoltuion results are presented and calculations of background and signal to noise ratios for the nonredundant aperture are made and compared with the single pinhole collimator. Author (NSA)

N75-25142# Battelle Pacific Northwest Labs., Richland, Wash.

RECENT ADVANCES IN GAS SCINTILLATION PROPORTIONAL COUNTERS

H. E. Palmer 1974 18 p refs Presented at Nucl. Sci. Symp., Washington, D. C., 11 Dec. 1974 Sponsored by ERDA
(BNWL-SA-5232; Conf-741213-5; Conf-741212-8) Avail: NTIS HC $3.25

Various geometrical configurations for gas scintillation proportional counters are investigated in order to determine which is best for use in a large volume, high efficiency counter for measuring low energy gamma and X-rays. A xenon-filled counter having a rod anode inside a cylindrical cathode appears to provide the best configuration for providing a uniform field and the best resolution over the total volume of the counter. The details of construction and operating characteristics of various shaped counters are described. Author (NSA)

N75-25143# Aerojet-General Corp., Sacramento, Calif.

EFFECTS OF CABLE SPLICES ON THERMOCOUPLE CHANNEL UNCERTAINTIES

R. D. Samuelson May 1970 22 p Sponsored by ERDA
(RN-TM-0598) Avail: NTIS HC $3.25

A typical thermocouple circuit is comprised of thermocouple cable splices between the measurement and reference junctions as well as several cable splices between the reference junction and the data system input. It is noted that all wire samples having the same nominal composition do not possess identical emf-temperature characteristics. The effect of splices between dissimilar cable sections on thermocouple data channel inaccuracy is described. Author (NSA)

N75-25144# Bendix Corp., Kansas City, Mo.

WIRE WOVEN TAPE MEASUREMENTS

C. W. Berry, Jr. Dec. 1974 18 p refs
(Contract AT(29-1)-613)
(BDX-613-1180) Avail: NTIS HC $3.25

A method for measuring the length, width, and thickness of nylon/copper-wire woven tapes was developed. Tapes are mounted on a constant tension and velocity reel system that allows continuous measurement of tapes. Length is measured with a rotary encoder, and width and thickness are measured with flex-pivot strain gage devices. Author (NSA)

N75-25145# Institut Franco-Allemand de Recherches, St. Louis (France).

FLOW ANALYSIS USING OPTICAL METHODS [ANALYSE DES ECOULEMENTS PAR METHODES OPTIQUES]

P. Smigielski 21 Jun. 1973 32 p refs In FRENCH Presented at Seminar on Flow Meas. Tech., Ermenonville, France, 24-28 Sep. 1973
(ISL-NB-5/73) Avail: NTIS HC $3.75

A summary of fundamental principles on the propagation of luminous rays in gaseous media with variable refraction indexes is presented. Optical methods for flow visualization at a given moment are described, using the technique of transformation of optical path variations in illumination variations: shadowgraph photographs, schlieren photography, and interferometry. Principles of holographic techniques used for flow visualization are also detailed: use of the returned waves, double exposure interferometry, and reinstatement of flow relief by injection of diffusing micro-particles. ESRO

N75-25146# LASAG S.A., Thun (Switzerland). Forschungsabteilung.

INVESTIGATION ON THE APPLICATION OF LASERS FOR THE MEASUREMENT OF DEFORMATIONS

10 Jul. 1974 46 p refs
(Contract ESTEC-2173/74-HP)
(ESRO-CR(P)-640) Avail: NTIS HC $3.75

The costs with respect to time, personal effort, and material are estimated for the development of a laser system to measure static deformation of large objects such as antennas and solar panels. Three methods are evaluated: the holographic method (holographic interferometry, holographic mapping, and holographic sampling), speckle photography, and dynamic measurement (stereoscanning). Cost is estimated for three regions of measurement accuracy (0, 1, 1, and 5mm) for each of three differentiated parts: theoretical background, definition of the apparatus, and development of an industrial apparatus. A fourth method, the diffusion pattern method, is proposed for evaluation. The most promising of the methods investigated is dynamic measurement. ESRO

N75-25147# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.

HETERODYNE DETECTION FOR HIGH RESOLUTION SPECTRAL ANALYSIS OF WEAK FAR INFRARED LINE RADIATION [HETERODYN-DETEKTION ALS MITTEL ZUR HOCHAUFLOESENDEN SPEKTRALANALYSE SCHWACHER LINIENSTRAHLUNG IM FERNEN INFRAROT]

K.-U. Dettmar and L. Haser Dec. 1974 42 p refs In GERMAN
(MPI-PAE/Extraterr-107) Avail: NTIS HC $3.75

A literature study on the principle and realization of heterodyne detectors for optical spectroscopy is presented. The heterodyne detector performs a transformation of optical frequencies into the GHz range, allowing electronic resolution of the Doppler profile of a spectral line. This is achieved by optical mixing of the incoherent signal radiation and the coherent radiation of a laser (local oscillator). A resolving power of 10 million may be obtained depending on the line width of the laser. Some results of applications to astronomical sources in the far infrared are reported. ESRO

N75-25148# Institut Franco-Allemand de Recherches, St. Louis (France).

VISUALIZATION METHODS USING THE DIFFERENTIAL INTERFEROMETER [VISUALISIERUNGSVERFAHREN MIT DEM DIFFERENTIALINTERFEROMETER]

G. Smeets and A. George 8 Oct. 1974 14 p refs In GERMAN
(ISL-38/74) Avail: NTIS HC $3.25

Various flow visualization methods are described and demonstrated for a shock-tube free jet. The methods were realized by combining a differential interferometer with appropriate auxiliary optical components, and allow visualization of the optical path of a phase object as well as all first and second derivations of this function of x, y, and time. Some of these methods are similar to the schlieren - and shadowgraph methods. ESRO

N75-25149# Army Engineer Topographic Labs., Fort Belvoir, Va.

A SINGLE LENS, FOUR CHANNEL MULTIBAND CAMERA. REPORT NO. 3 IN THE ETL SERIES ON REMOTE SENSING

Robert K. Brooke, Jr. Nov. 1974 46 p refs
(DA Proj. 4A7-62707-A-854)

(AD-A008351; ETL-ETR-74-4) Avail: NTIS CSCL 14/5

A single lens, four-channel multiband aerial camera was designed and fabricated. A multielement beam-disperser with dichroic filters separates the incoming energy into four spectral bands, nominally blue, green, red, and near infrared, and images each on an individual 70-mm black and white film frame. The camera was subjected to laboratory, ground, and aerial tests to evaluate its performance characteristics. Results are discussed. GRA

N75-25150# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

TEXTURE-TONE STUDY WITH APPLICATION TO DIGITIZE IMAGERY Final Technical Report

Robert M. Haralick Aug. 1974 53 p refs
(Contract DAAK02-70-C-0388; DA Proj. 4A0-62112-A-854)
(AD-A008030; RSL-TR-182-6; ETL-CR-74-17) Avail: NTIS CSCL 09/2

Texture is one of the important characteristics used in identifying objects or regions of interest in an image, whether the image be a photomicrograph, an aerial photograph, or a satellite image. This report describes some easily computable textural features based on grey tone spatial dependencies and illustrates their application in category identification tasks of three different kinds of image data: photomicrographs of 5 kinds of sandstones, 1:20,000 panchromatic aerial photographs of 8 land use categories and ERTS (Earth Resources Technology Satellite) multispectral imagery containing 7 land use categories. The author uses two kinds of decision rules: one for which the decision regions are convex polyhedra (a piecewise linear decision rule) and one for which the decision regions are rectangular parallelpipeds (a min-max decision rule). Another application of texture analysis is with respect to camouflage design problems and the author develops a textural transform for the feature extraction of camouflage clutter. GRA

N75-25151# Applied Research Labs., Sunland, Calif.

THE DEVELOPMENT, BUILDING, AND TESTING OF AN ADVANCED ION MICROPROBE (AIM) ION SOURCE SYSTEM Final Report, 10 Jan. 1972 - 30 Sep. 1974

Richard T. Martin, Richard D. Fralick, and Henry J. Roden 26 Nov. 1974 50 p refs
(Contract F33657-72-C-0632; ARPA Order 1702; VT Proj. 1412)
(AD-A008411) Avail: NTIS CSCL 14/2

An Ion Microprobe was designed, built and tested which has demonstrated primary beam spot sizes of 0.3 micrometer and should be capable of spot sizes of 0.1 micrometer. The improved spot size over previously available devices is due to greatly reduced spherical aberration in the objective lens. A secondary ion and electron collection and focusing system permits secondary ions sputtered from the sample to be transmitted to a Mass Spectrometer for analysis or permits secondary electrons from the sample to be detected for the purpose of topographical imaging of the sample in a scanning electron or scanning ion microscope mode. GRA

N75-25152# Texas Instruments, Inc., Dallas. Central Research Labs.

SURFACE PASSIVATION STUDIES ON PbSnTe DIODE INFRARED DETECTORS Final Technical Report

Joseph S. Wrobel, S. G. Parker, Richard L. Guldi, and David W. Bellavance Dec. 1974 70 p refs
(Contract DAAK02-74-C-0120)
(AD-A008025; TI-08-74-77) Avail: NTIS CSCL 17/5

The development of diffused junction PbSnTe has resulted in high performance, high impedance detectors in the 8- to 14-micrometer region. However, this accomplishment is restricted by the lack of uniformity of resistance from element to element for detector arrays. The objectives of this program were to identify the leakage mechanism responsible for low resistance, minimize its effect on detector array performance, and passivate the surface of the device. GRA

N75-25153# Radio Corp. of America, Burlington, Mass. Government Communications and Automated Systems Div.

MANUFACTURING METHODS AND TECHNOLOGY PROGRAM AUTOMATED IMAGE DEVICE EVALUATOR (AIDE) Quarterly Progress Report, 1 Oct. - 31 Dec. 1974

E. W. Ketler Jan. 1975 47 p refs
(Contract DAAB05-74-C-2524)
(AD-A008031; QPR-4) Avail: NTIS CSCL 09/1

The purpose is to establish a manufacturing method and technology program for an Automated Image Device Evaluator (AIDE) which will provide a computer controlled test system capable of performing production acceptance testing of second generation image intensifier tubes at the manufacturer's plant. This report presents a technical and physical description of the Development Model equipment design and configuration. The work accomplished during the quarter and the task schedule are also presented. Plans for the next quarter have been developed and are outlined. GRA

N75-25154# Pattern Analysis and Recognition Corp., Rome, N.Y.

ADVANCED MULTISPECTRAL IMAGE DESCRIPTOR SYSTEM (AMIDS). VOLUME 2: USER'S MANUAL Final Technical Report, Dec. 1971 - Sep. 1974

John C. Lietz, Michael J. Gillotte, Jr., Gerald T. Stevens, and Donald House Feb. 1975 445 p refs
(Contracts F30602-72-C-0140; F30602-73-C-0371; AF Proj. 6244)
(AD-A008196; DAR-75-2; RADC-TR-74-346-Vol-2) Avail: NTIS CSCL 09/2

This report is prepared in the form of a user's manual for personnel engaged in the operation of the RADC Image Processing System. This system has been developed under the following contracts (listed in chronological order): Image Feature Extraction System (IFES); Spectral Combinations for Reconnaissance Exploitation (SCORE); Advanced Multispectral Image Descriptor System (AMIDS). These efforts have had the common goal of developing a research tool for the design and development of image processing and pattern recognition techniques. The IFES program has concentrated on spatial characteristics, SCORE on spectral characteristics, and AMIDS on implementing classic pattern recognition algorithms. These systems reside within one software framework in the PDP-11/20/SDS-800 system which is located in the Spectral Response Analysis Center (SRAC). GRA

N75-25155# Armed Forces Radiobiology Research Inst., Bethesda, Md.

LEAD SHIELF TO IMPROVE DETECTION OF HIGH-ENERGY PHOTONS OF 38K AND 42K BY SCINTILLATION CAMERAS

J. S. Stevenson Oct. 1974 17 p refs
(AD-A008149; AFRRI-TN74-9) Avail: NTIS CSCL 06/2

A lead shield was designed and tested for use with the pinhole collimator of the Nuclear-Chicago HP scintillation camera to detect photons of 38K and 42K for cardiac scanning. A discussion of each isotope with reference to cardiac scanning is given with especial emphasis upon the problems of imaging high-energy photons, i.e., 511 keV or higher with the presently available scintillation cameras. GRA

N75-25156# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.

THE DOPPLER-SHIFT LASER ANEMOMETER

C. Y. She, D. F. Edwards, and R. J. Churchill Jun. 1974 38 p refs
(Contract F19628-70-C-0035; AF Proj. 7260)
(AD-A008024; SR-10; AFCRL-TR-74-0284) Avail: NTIS CSCL 14/2

A brief review is given of the laser anemometer as it applies to the measurement of flow velocity and turbulence in a fluid. It is shown that the fluid velocity can be obtained from the intensity correlation function which is the Fourier transform of the intensity power spectrum. The technique of signal clipping is used to economize on equipment requirements and the relations are given between the true and clipped correlation functions for several cases of interest. Feasibility is shown for measuring the fluid flow parameters for a free jet. Additional experiments and analyses would be necessary before the anemometer system can be used as an accurate diagnostic probe for turbulent fluids. GRA

N75-25157# Army Foreign Science and Technology Center, Charlottesville, Va.
THEORY OF PHOTOGRAPHIC COLOR REPRESENTATION
L. F. Artyushin and N. S. Ovechkis 25 May 1974 26 p refs
Transl. into ENGLISH from Usp. Nauchn. Fotogr. Akad. Nauk SSSR (Moscow), no. 15, 1970 p 244-256
(AD-A008264; FSTC-HT-23-1263-73) Avail: NTIS CSCL 14/5

A review is given of the theory of color reproduction from its early beginnings in 1861. The author deals with the research which has been carried out on color reproduction, graduation test methods, color correction and spectral and colormetric studies. There is also a discussion of the psychophysiological aspects of color reproduction and correction. GRA

N75-25158# Naval Ordnance Lab., White Oak, Md.
THE NOL BALLISTIC PISTON COMPRESSOR 3: ELECTRONIC INSTRUMENTATION Final Report, Jul. - Dec. 1974
Harry E. Cleaver 18 Dec. 1974 26 p refs
(AD-A008147; NOLTR-74-220) Avail: NTIS CSCL 14/2

A detailed description is given of the new electronic instrumentation package for the ballistic piston compressor. Design considerations, including synchronization of compressor accessories and data acquisition schemes, are discussed and circuit diagrams are provided that permit construction of duplicate systems and maintenance or trouble-shooting of the present system. GRA

N75-25159# Naval Ship Research and Development Center, Bethesda, Md.
PRESSURE-TOLERENT DEVICE TECHNOLOGY STATE OF THE ART
V. W. Pugliese and D. E. Gilbert May 1975 64 p refs
(XF54545010)
(AD-A008558; NSRDC-4297) Avail: NTIS CSCL 09/3

The report describes the research effort devoted to the study and development of a device and material technology to provide electronic and electrical components, circuits, and equipment that will operate successfully in the ocean environment without the need for pressure shell protection. The work has been concerned with: (1) identification and evaluation of device problem areas, (2) development of technology to be used to prevent device failures, and (3) identification and evaluation of system requirements. Its purpose is to document, in a logical manner, the results of the work in determining the influences of an oil/pressure environment on contemporary electronic/electrical components and systems. GRA

N75-25160# Westinghouse Electric Corp., Pittsburgh, Pa. Research and Development Center.
LRAPP VERTICAL ARRAY, PHASE 4 Final Report, 15 Oct. - 30 Nov. 1974
C. H. Jones 13 Jan. 1975 52 p refs
(Contract N00014-74-C-0193; NR Proj. 292-674)
(AD-A008427; Rept-75-9M7-VERAY-R1) Avail: NTIS CSCL 08/10

Earlier reports (Phase II and III) describe a vertical array of hydrophones that were built by Westinghouse Electric Corporation for measuring noise in the ocean at frequencies from 10 Hz to 300 Hz. The report describes modifications and tests of this equipment for a deployment that was made near Bermuda on November 12, 1974. The array is 3600 meters long and contains five hydrophones. GRA

N75-25161# Accumetrics Corp., Cambridge, Mass.
PIEZOELECTRIC TRIAXIAL ACCELEROMETER SYSTEM FOR USE IN SATELLITE AIR DENSITY MEASUREMENTS Interim Report
Donald H. Fryklund Sep. 1974 42 p
(Contract F19628-72-C-0225; AF Proj. 6690)
(AD-A008040; AFCRL-TR-74-0524; SR-1) Avail: NTIS CSCL 14/2

A piezoelectric triaxial accelerometer system has been evolved for use in satellite based neutral air density measurements. Piezoelectric bimorphs are heavily loaded with masses that are clamped at sealevel and are released in orbit by the use of pyrodevices. The satellite spin provides signal chopping to enable narrow-banding to reduce noise. GRA

N75-25162# United Aircraft Corp., East Hartford, Conn. Research Labs.
FOCUSED LASER BEAMS TO ASSIST ROCK EXCAVATION Final Report, Nov. 1973 - Oct. 1974
B. R. Jurewicz, L. E. Greenwald, and C. O. Brown Nov. 1974 161 p refs
(Contract DOT-FR-20021)
(PB-239426/0; UARL-N971543-11; FRA-ORD/D-75-20) Avail: NTIS HC $6.25 CSCL 13B

The feasibility of using a focused CO2 laser beam to cut the gage of a hard-rock tunnel being excavated by a continuous tunnel-boring machine was assessed. Laser rock-kerfing tests were conducted on isolated samples of granite diabase and quartzite rock with an electric-discharge CO2 laser. The tests were performed to verify previous extrapolations which were used to predict full-scale power requirements for the laser gage-kerfing concept. Laser powers and kerfing speeds were extended from previously tested maximum values of 5 kW and 21.2 cm/sec to 16.5 kW and 125 cm/sec. In addition, the test program included a comparison of the use of 50.8 cm-focal-length spherical and cylindrical focusing mirrors. GRA

N75-24975 Joint Publications Research Service, Arlington, Va.
HYDROACOUSTIC VIBRATION TRANSMITTER
S. M. Kidun, M. I. Gavriliv, V. M. Sardyga, and A. M. Agizim *In its* Signal Selection and Transmission (JPRS-64817) 21 May 1975 p 8-20 refs Transl. into ENGLISH from Otbor i Peredacha Informatsii (Kiev), no. 22, 1969 p 66-68 (For availability see N75-24973 16-31)

N75-25560 Medical Physics Inst. Utrecht (Netherlands).
DOUBLE-PULSE EXCITATION OF PIEZOELECTRIC TRANSDUCERS
J. C. Somer and W. J. Kooij *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 150-154 refs (For availability see N75-25543 16-52)

N75-25821 Harvard Coll. Observatory, Cambridge, Mass. Center for Astrophysics.
X-RAY CAMERA FOR THE DETECTION AND LOCALIZATION OF GAMMA RAY BURSTS
H. Helmken, P. Gorenstein, and H. Gursky *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 51-55 refs Prepared jointly with Smithsonian Astrophys. Obs. (For availability see N75-25813 16-93)

N75-25823 Birmingham Univ. (England). Dept. of Space Research.
A DETECTOR FOR GAMMA RAY BURSTS
D. H. Brabban, G. M. Simnett, A. J. Dean (Southampton Univ.), and D. Ramsden (Southampton Univ.) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 63-68 refs (For availability see N75-25813 16-93)

N75-25835 Case Western Reserve Univ., Cleveland, Ohio.
A LARGE-AREA BALLOON-BORNE GAMMA RAY DETECTOR
T. Jenkins, P. Albats, G. Frye, R. Kolman, S. Schindler, R. Schreiner, G. B. Thomson, and O. B. Mace (Melbourne Univ.) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 171-173 (For availability see N75-25813 16-93)

N75-25836* California Univ., San Diego.
THE UCSD/MIT HARD X-RAY AND LOW ENERGY GAMMA RAY EXPERIMENT FOR HEAO-A
J. L. Matteson, R. M. Pelling, and L. E. Peterson (Tata Inst. of Fundamental Res.) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 177-184 refs (For availability see N75-25813 16-93)
(Contract NAS8-27974)

N75-25837 Consiglio Nazionale delle Ricerche, Milan (Italy). Lab. di Fisica Cosmica e Tecnologie Relative.
A SENSITIVE TELESCOPE FOR LOW ENERGY GAMMA RAY ASTRONOMY

D. Maccagni, C. Paizis, F. Perotti, R. Stiglitz, G. Villa, P. Bailey (Southampton Univ.), A. J. Dean (Southampton Univ.), and D. Ramsden (Southampton Univ.) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 185-193 refs Prepared jointly with Milan Univ. (For availability see N75-25813 16-93)

N75-25838* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SAS-2 OBSERVATIONS OF GAMMA RAYS FROM THE GALACTIC PLANE
D. J. Thompson, G. F. Bignami, C. E. Fichtel, R. C. Hartman, and D. A. Kniffen *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 201-204 refs Partly sponsored by ESRO (For availability see N75-25813 16-93)

N75-25851 Smithsonian Institution, Amado, Ariz. Mount Hopkins Observatory.
THE ATMOSPHERIC CERENKOV TECHNIQUE FOR GAMMA RAY ASTRONOMY
T. C. Weekes and G. H. Rieke (Arizona Univ., Tucson) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 287-293 refs (For availability see N75-25813 16-93)

N75-25853 Harvard Coll. Observatory, Cambridge, Mass. Center for Astrophysics.
OBSERVATIONS OF NP 0532 AT 1000 TO 10000 GeV GAMMA RAY ENERGIES
J. E. Grindlay, H. F. Helmken, and T. C. Weekes *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 301-306 refs Prepared jointly with Smithsonian Astrophys. Obs. (For availability see N75-25813 16-93)

N75-25854 Consiglio Nazionale delle Ricerche, Milan (Italy). Lab. di Fisica Cosmica e Tecnologie Relative.
THE COS-B EXPERIMENT FOR GAMMA RAY ASTRONOMY
G. F. Bignami, G. Boella, J. J. Burger, P. Keirle, H. A. Mayer-Hasselwander, J. A. Paul, E. Pfeffermann, L. Scarsi, B. N. Swanenburg, B. G. Taylor et al *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 307-322 refs Prepared jointly with Milan Univ., Leiden Univ., CEA, Saclay, France, Max-Planck-Inst. fuer Physik u. Astrophys., Palermo Univ. and ESRTC (For availability see N75-25813 16-93)

N75-25858 Consiglio Nazionale delle Ricerche, Milan (Italy).
GAMMA RAY SOURCE PULSATING PATTERN SYNCHRONISATION VIA SIMULTANEOUS X RAY OBSERVATION IN THE COS-B MISSION
G. Boella, R. Buccheri, J. Burger, P. Coffaro, and J. Paul *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 353-362 Prepared jointly with Milan Univ., Palermo Univ., Leiden Univ., and CEA (For availability see N75-25813 16-93)

N75-25859 European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
OBSERVATION OF TERRESTRIAL ALBEDO GAMMA RAYS FROM THE COS-B ORBIT
R. D. Wills *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 363-368 refs (For availability see N75-25813 16-93)

36 LASERS AND MASERS

Includes parametric amplifiers.

N75-25163# Joint Publications Research Service, Arlington, Va.
PARAMETERS OF LASER PULSES PASSING THROUGH A WATER MEDIUM
V. I. Bespalov, A. M. Kiselev, A. M. Kubarev, and G. A. Pasmanik 2 Jun. 1975 4 p refs Transl. into ENGLISH from Izv. Nauk SSSR, Fiz. Atm. Okieana (Moscow), v. 11, no. 3, 1975 p 324-326
(JPRS-64893) Avail: NTIS HC $3.25

Results of experiments devoted to investigating parameters of laser pulses passing through a water medium are reported. Author

N75-25164*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEVELOPMENT OF A LASER DOPPLER SYSTEM FOR THE DETECTION, TRACKING, AND MEASUREMENT OF AIRCRAFT WAKE VORTICES Final Report
Robert M. Huffaker, Harold B. Jeffreys, Edwin A. Weaver, James W. Bilbro, Glen D. Craig, Ronald W. George, Edmund H. Gleason, Peter J. Marrero, Earl J. Reinbolt, and John E. Shirey Mar. 1975 212 p refs Sponsored in part by FAA
(NASA-TM-X-66868; FAA-RD-74-213) Avail: NTIS HC $7.25 CSCL 20E

A Scanning Laser Doppler Vortex System (SLDVS) has been developed for use as an aircraft trailing vortex detection, tracking, and measuring system. This report describes the SLDVS design, development, and checkout at MSFC. Previous efforts at MSFC had demonstrated the capability of laser Doppler systems to accurately measure remote wind velocity and turbulence. To assure the proper overall system design, tradeoff studies were performed to determine optimum design parameters. The SLDVS has demonstrated overall systems accuracy against known calibrated targets of + or - 3.3 ft at 492 ft. During cooperative flybys at MSFC, the SLDVS has located the center positions of the B-737 and B-720 aircraft vortices to within + or - 10 ft. Author

N75-25165# Defence Research Establishment Valcartier (Quebec).
NEAR SINGLE-LINE OPERATION OF A FREE BURNING CS2/O2/N2O FLAME LASER WITH A NONDISPERSIVE OPTICAL CAVITY
K. D. Foster, G. H. Kimbell, and D. R. Snelling Feb. 1975 18 p refs
(DREV-4000/75) Avail: NTIS HC $3.25

The CS2/O2/N2O flame laser was operated under conditions in which the spectral output is nearly single line. This transition is the P10-9 (17) of CO at 5.4265 microns, the same transition which was observed to oscillate in single line fashion by Hirose et al in an electrically initiated CO chemical laser. It is suggested that the unique behavior of this line may be due to its close proximity to a P branch transition in an adjacent band, namely the P9-8 (23) line, such that the gain profiles of the two lines overlap. Calculations suggest that, for this to be true at the conditions of these experiments, the separation of the line centers for this pair must be about 0.3 A or less. The P10-9 (17) transition was also found to be totally absent under certain conditions of high multiline power, particularly at low O2 and N2O flows. This may be due to absorption by a high band R branch transition at 5.4266 microns namely, the R15-16 (32) line. Author

N75-25166# Aerospace Corp., El Segundo, Calif. Lab. Operations.
DENSITY PERTURBATIONS IN TRANSONIC SLUING LASER BEAMS Interim Report
John W. Ellinwood and Harold Mirels 5 Mar. 1975 24 p refs
(Contract F94701-74-C-0075)
(AD-A008513; TR-0075(5620)-1; SAMSO-TR-75-98) Avail: NTIS CSCL 20/6

A linearized theory is presented for density perturbations induced in a sluing laser beam as a function of time after beam turn-on and cross-flow Mach number M. The net local density perturbation is expressed as the sum of an isobaric and isentropic perturbation. A closed-form solution was obtained for M = 1, where the isentropic perturbations peak, and uniform heat addition in a circular beam. The results are compared with a corresponding one-dimensional beam. Poor agreement is found at large time, where the isentropic density perturbation varies as t and t(1/2) for the one-dimensional and two-dimensional cases, respectively. An order-of-magnitude estimate for the final steady-state density perturbation, at M = 1, and the time scale in which it is achieved were obtained by consideration of nonlinear effects. Author (GRA)

N75-25167# Aerospace Corp., El Segundo, Calif.
A REVIEW OF RATE COEFFICIENTS IN THE H2-Cl2

CHEMICAL LASER SYSTEM Interim Report
Norman Cohen and Jerry F. Bott 19 Mar. 1975 71 p refs
(Contract F04701-74-C-0075)
(AD-A008166; TR-0075(5530)-7; SAMSO-TR-75-82) Avail: NTIS CSCL 07/4

The chemical and energy transfer reactions involved in the H2-Cl2 chemical laser system are discussed. Current experimental and theoretical evidence relevant to a selection of the most probable values of rate coefficients is reviewed, and a set of best values is recommended. Dissociation-recombination, metathesis, and energy transfer reactions are covered. GRA

N75-25168# Aerospace Corp., El Segundo, Calif.
SPECTROSCOPIC AND INFRARED MEASUREMENTS ON cwHF(DF) CHEMICAL LASERS Interim Report
Munson A. Kwok, Robert R. Giedt, and Edward F. Cross 28 Feb. 1975 41 p refs
(Contract F04701-74-C-0075)
(AD-A008164; TR-0075(5534)-1; SAMSO-TR-75-78) Avail: NTIS CSCL 20/5

The supersonic, free-jet medium of a 10 to 15 kW, HF/DF chemical laser is studied. Results from a remotely controlled spectrograph that scans rapidly, spatially, and spectrally are described; observations from an IR vidicon system are also given. The laser system includes two types of plenum gas heater: arc and combustor; and two types of nozzle bank: split and axisymmetric. The spectrograph measures the HF 3-0 P-branch emission, from which HF(3) number density along the line-of-sight N3L and rotational temperature T(R) are deduced at a large number of spatial positions. The data can be given as three types: (1) spatial scans transverse to the flow, (2) scans parallel to the flow, and (3) data at fixed position. Various interpretations concerning the medium result from the three types of data. GRA

N75-25169# Athens Coll., Ala. Science Div.
CHEMICAL LASER DILUENTS Final Report, Jun. 1974 - Feb. 1975
Joseph K. McDonald Feb. 1975 14 p refs
(Contract DAAH01-74-C-0813; DA Proj. 1T6-62609-A-308)
(AD-A008077; RK-CR-75-26) Avail: NTIS CSCL 20/5

The purpose of this study was to monitor the effects of diluents on a HCl laser. The initial plans were to obtain an HCl laser with a mixture of helium, hydrogen, and chlorine, and then try other chemicals. However, it was found in the present study that no diluent enhanced the laser signal. GRA

N75-25170# University of Southern Calif., Los Angeles. Electronic Sciences Lab.
IR WINDOW STUDIES Final Report, 1 Jun. 1972 - 31 Aug. 1974
Ferdinand A. Kroger and John H. Marburger 15 Sep. 1974 111 p refs
(Contract F19628-72-C-0275; ARPA Order 2055)
(AD-A007975; AFCRL-TR-74-0557) Avail: NTIS CSCL 20/5

Contents: Epitaxial growth of semi-insulating GaAs from Ga solutions; Optimization of alkali halide window materials; Growth of crystals for infra red window research; Fabrication of polycrystalline IR window materials; Mechanical behavior of III-V and II-VI compounds; Dielectric constant measurements; Study of defects in II-VI compounds; Theoretical studies of absorption mechanisms in IR window materials; Investigation of infrared loss mechanisms in high resistivity GaAs; Alkali halide surface studies with acoustic probe techniques; Absorption studies of CdTe and ZnSe; Characterization of optical performance of IR window systems; Laser damage studies. GRA

N75-25171# Radio Corp. of America, Burlington, Mass.
HIGH RADIANCE AlGaAs LASER ILLUMINATOR Final Report, Jan. 1973 - Mar. 1974
William W. Barratt and Larry S. OHara Nov. 1974 71 p refs
(Contract F33615-73-C-1204; AF Proj. 1177)
(AD-A007976; AFAL-TR-74-208) Avail: NTIS CSCL 20/5

The scope of the program was to conduct research and development of a High Radiance Aluminum Gallium Arsenide (AlGaAs) Laser Illuminator and to fabricate, test and deliver an experimental model of the system developed. This development was aimed at a reduction in the exit aperture, size, and weight of the projection optical system required for a narrow field, high power, liquid nitrogen (LN2) cooled illuminator used in conjunction with gated Low Light Level TV systems. In order to achieve these goals, the development was aimed at producing an improvement in the average brightness of the injection laser array. This was accomplished by reducing the beam divergence from the injection laser diode arrays through use of a micro-cylindrical lens method. Details of this method, its application to an array and optical integrator assembly and incorporation into an illuminator system are covered. GRA

N75-25172# Mathematical Sciences Northwest, Inc., Bellevue, Wash.
EXPERIMENTAL STUDY OF SUBSONIC LASER ABSORPTION WAVES Final Report, Jun. 1972 - Nov. 1973
E. L. Klosterman and S. R. Byron Mar. 1975 131 p refs
(Contract F29601-71-C-0078; AF Proj. 1905)
(AD-A007885; MSNW-73-101-4; AFWL-TR-74-3) Avail: NTIS CSCL 20/5

A shock tube-driven gas dynamic laser operating at 10.6 micrometers has been used to study subsonic laser absorption waves. These waves result from the interaction of laser radiation with various metal and ablator surfaces. In the experiments reported here, various individual parameters were varied including the laser intensity and the laser beam diameter. Measurements of the wave propagation speed and its dependence on laser power, laser beam diameter and ambient air pressure were made. In addition, measurements of the properties of the plasma produced by the wave included determination of the 10.6 micrometer absorption coefficient, the air density field, and the spectral emission. Measurements of the target thermal response and mass loss were also made. It was established that radiative rather than thermal conduction transport dominates the propagation of these waves and that two-dimensional hydrodynamic flow is a dominant feature of the wave. GRA

N75-25173# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
A USER'S GUIDE FOR THE CONTINUOUS WAVE LASER DAMAGE COMPUTER PROGRAM
R. W. Newman Dec. 1974 92 p refs
(Contract N00017-72-C-4401)
(AD-A008559; APL-JHU-TG-1268) Avail: NTIS CSCL 20/5

A Continuous Wave Laser Damage computer program (CLAD) has been developed to compute material damage caused by a high power laser beam impinging on material surfaces. The program includes three-dimensional conduction, temperature dependent thermal properties, radiation relief, aerodynamic heating, laser radiation heating, heats of fusion and vaporization, chemical ablation, and material removal for flat and cylindrical bodies. The program uses finite difference techniques to compute mass loss and temperature histories of laser irradiated metals, ceramics, and ablatives. This report describes the computational methods contained in CLAD, along with some of the assumptions and limitations contained therein. The report is written as a user's manual and contains a description of the main program required to perform a CLAD analysis. Also included is a sample problem, the corresponding main program, and printed output, which will familiarize the user with an actual application of CLAD. GRA

N75-25174# Aerospace Corp., El Segundo, Calif.
PARAMETRIC EVALUATION OF POTENTIAL ELECTRONIC TRANSITION LASERS Interim Report
David G. Sutton and Steven N. Suchard 19 Mar. 1975 55 p refs
(Contract F04701-74-C-0075)
(AD-A008165; TR-0075(5641)-1; SAMSO-TR-75-79) Avail: NTIS CSCL 07/4

Through the use of a generalized computer code that calculates the minimum reactive branching ratio required for a species to display optical gain, a parametric study was performed to ascertain which properties of the electronic potential curves of a diatomic molecule have the greatest effect on the suitability of that molecule as a potential electronic transition laser. The results of this study demonstrate that diatomic systems separate into different classes when the question of the minimum required reactive branching ratio is confronted. This separation of molecular systems was translated through the use of compiled molecular constants into a determination of which vibrational-level distribution class is most favorable for specific molecules to display optical gain; potential laser candidates were pointed out. In addition, a generalized gain equation for electronic transitions in diatomic molecules that takes into account both rotational and vibrational partitioning was derived. GRA

N75-25175# Army Foreign Science and Technology Center, Charlottesville, Va.
SYNCHRONIZATION OF NINE SOLID-STATE OPTICAL QUANTUM GENERATORS
A. M. Kugushev, N. S. Golubeva, and V. N. Rozhdestvin 5 Jun. 1974 14 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Radioelektronika (USSR), v. 14, no. 4, 1971 p 363-370
(AD-A008245; FSTC-HT-23-0484-74) Avail: NTIS CSCL 20/5

Questions for synchronizing solid-state lasers are studied. The transient process for a line of nine lasers to come into step, based on the quasi-classical theory of lasers is analyzed. Numerical analysis of the speed for synchronization, its dependence on the mutual misalignment of lasers, and the coupling coefficient and amplitude distribution of fields along the line was done on a computer. GRA

N75-25176# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala. Propulsion Directorate.
TIMING OF LASER PULSES
Pasquale Martgnoni, Herbert C. Ruge, and Charles Cason 24 Feb. 1975 7 p
(DA Proj. 1T6-62621-AH-81)
(AD-A008255; RK-TR-75-4) Avail: NTIS CSCL 20/6

An electronic system to measure the laser pulse appearance delay time and pulse time width has been designed, assembled and tested. This electronic device may also be used with other systems. GRA

N75-25177# Aerospace Corp., El Segundo, Calif.
TWO-ELECTRON LASER TRANSITION IN Sn(I) Interim Report
David G. Sutton, Luis Galvan, Jr., and Steven N. Suchard 21 Feb. 1975 6 p refs
(Contract F04701-74-C-0075)
(AD-A008160; TR-0075(5641)-5; SAMSO-TR-75-61) Avail: NTIS CSCL 20/5

A new laser oscillation has been observed in a pulsed discharge of He and SnCl4. This oscillation at 1.061 micrometers corresponds to the (5s)5p3 triplet D(1) to (5s)2(5p)(6p) triplet P(2) transition in Sn(I). GRA

N75-25178# United Aircraft Corp., East Hartford, Conn.
INVESTIGATION OF NON-LINEAR PROPAGATION AND CHIRPING OF CO2 LASERS Semiannual Report, 1 Apr. - 30 Sep. 1969
David C. Smith, Stephen Marcus, and John H. McCoy 30 Sep. 1969 7 p
(Contract N00014-69-C-0308; NR Proj. 016-204)
(AD-A008539; UARL-H920832-1) Avail: NTIS CSCL 20/5

Research is summarized on non-linear propagation of CO2 laser radiation (10.6 micrometer wavelength) in absorbing and amplifying media, the generation and propagation of mode locked CO2 laser radiation, and the chirping or frequency sweeping of CO2 laser pulses. GRA

N75-25179# Massachusetts Inst. of Tech., Cambridge. Fluid Mechanics Lab.
TUNABLE LASERS Technical Report, 1 Jul. - 31 Dec. 1974
C. Forbes Dewey, Jr. and L. O. Hocker 31 Dec. 1974 28 p refs
(Contract N00014-67-A-0204-0092; ARPA Order 2840)
(AD-A008573; FML-74-1) Avail: NTIS CSCL 20/6

The authors have produced continuously-tunable infrared radiation between 4 micrometers and 21 micrometers by mixing the outputs of a ruby laser and a ruby-pumped dye laser in a single rotationally-twinned ZnSe crystal. Regularly-spaced twins should produce an enhancement proportional to the square of the number of twin planes. Preliminary work suggests absorption due to two photon carrier generation may be responsible for the early saturation of the IR conversion efficiency with pump laser intensity. Twelve (4 bar, 3 sub m) crystals are noted for possible application for 10 micrometer frequency doubling using regularly spaced rotational twins to make them phase-matchable. Additional crystals suitable for frequency-doubling Nd-YAG lasers into the blue-green spectral region have been identified. Further characterization of the wavelength tuning regions of new-infrared wavelength tuning regions of near-infrared laser dyes has been completed. The effects of optical pumping geometry have been studied for ruby-pumped dye lasers. GRA

N75-25180# Exxon Research and Engineering Co., Linden, N.J. Government Research Lab.
PHOTODISSOCIATION DYE LASER Semiannual Technical Report, 1 Oct. 1974 - 1 Mar. 1975
Abraham Kasdan 24 Jun. 1975 37 p refs
(Contract N00014-73-C-0048; ARPA Order 1806)
(AD-A008571; GRUS.1BEOB.75) Avail: NTIS CSCL 07/5

The photodissociation dye laser (PDL) program is an effort to develop a new class of tunable liquid lasers operating in the visible region of the spectrum. In the PDL scheme, laser action occurs between an excited electronic state and the ground electronic state of radicals produced by the photodissociation of specific classes of molecules in solution. Five promising PDL molecules have been synthesized and their absorption spectra characterized. A pulsed tunable UV source has been assembled to investigate their fluorescence characteristics. Hexaphenylethane has been identified as the most promising PDL candidate for an initial study. Triphenylmethyl radical fluorescence has been observed in the hexaphenylethane system. GRA

N75-25181# ILC Technology, Inc., Sunnyvale, Calif.
PRODUCTION ENGINEERING MEASURE FOR OPTICAL PUMPS FOR LASERS Quarterly Report, Oct. - Dec. 1974
Robert Maynard and John Oblanas 15 Jan. 1975 23 p refs
(Contract DAAB05-73-C-2078)
(AD-A007257; R-ILC-73-22; QR-6) Avail: NTIS CSCL 20/5

This program is directed towards establishing a capability for manufacturing flashlamps that are to be used as optical pumps for laser systems. This report describes the work carried out during the sixth quarter of the program. Life tests were conducted on two lamps constructed with 1.0 mm thick walls of synthetic fused quartz. These lamps showed less degradation with life than did the second engineering test sample lamps constructed with 0.5 mm thick walls. Proposed changes to the lamp specification SCS-436A were recommended on the basis of lamp and test equipment data accumulated to date. The government furnished test laser was refurbished and the two government furnished life test vehicles were repaired. GRA

N75-25182# TRW Systems Group, Redondo Beach, Calif.
CHEMICALLY PUMPED ULTRAVIOLET LASER STUDY Final Report, 17 Apr. 1973 - 17 May 1974
J. A. Betts Mar. 1975 123 p refs
(Contract F29601-73-C-0077; AF Proj. 1256)
(AD-A007888; AFWL-TR-74-165) Avail: NTIS CSCL 07/4

The work described herein was directed towards (1) demonstrating that a particular chemical reaction has lasing potential and (2) attempting to find other systems with lasing potential using rare gas metastable energy transfer. The first part of the program concentrated on the particular reaction C + COS to CS + CO which pumps the CS(a triplet Pi) state whose 0-0 transition radiates at 3625A. During the course of the program, an analogous reaction to the one above C + COSe to CSe + CO was studied. The CSe(a triplet Pi) state was identified for the first time. Studies were performed in a flowtube experiment to demonstrate that the above reactions do indeed occur. The quenching of excited CSe and CS by COS, CO, CO2, N2 and NO was studied. No lasing was observed in any of the above experiments. The second part of the program concentrated on production of emission from molecular states using energy transfer from rare gas metastable atoms. The substances studied were boron trichloride, boron tribromide, carbonyl selenide, germanium tetrachloride, germane, hydrogen fluoride, silane and silicon tetrabromide. The resulting emissions are reported. GRA

N75-25183# Aerospace Corp., El Segundo, Calif. Lab Operations
TEMPERATURE MEASUREMENT IN A CW HF CHEMICAL LASER PLENUM Interim Report
Robert L. Varwig and Munson A. Kwok 19 Mar. 1975 28 p refs
(Contract F04701-74-C-0075)
(AD-A008508; TR-0075(5240-50)-4; SAMSO-TR-75-81) Avail: NTIS CSCL 20/5

The temperature of a SF6-He gas mixture in the plenum of a supersonic diffusion laser was measured by observing spectra of the HF(v) molecules when trace amounts of H2 were injected into the hot plenum gas. Because the plenum pressures were relatively high and the mean free path very short, rotational equilibrium was expected to be obtained. Thus, the rotational temperature obtained from the observed spectra was expected to equal the gas translational temperature. Precision of the temperature was + or - 10% largely because of the limited precision involved in the measurement of the slope of the intensity data. The observed values are about 10 to 36% higher than temperatures obtained from a pressure ratio method. This difference is probably because of the wall heat loss that occurs between plenum and throat, which was not taken into account in the pressure ratio method. GRA

N75-25184# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala. Physical Sciences Directorate.
TARGET DAMAGE STUDIES WITH A PULSED CO2 TEA LASER FACILITY
J. Lynn Smith 25 Jun. 1974 17 p
(AD-A008313; RR-74-6) Avail: NTIS CSCL 20/5

A pulsed CO2 TEA laser facility had been developed and applied to the measurement of surface damage thresholds of several practical materials, inclusive of ZnSe and A/R-coated Ge. The pulse shape of optical emission during LSA wave initiation has been recorded on oscillograms. Among the principal conclusions is that polycrystalline chemical vapor deposited ZnSe has a higher damage threshold than polycrystalline hot press ZnSe; also LSA wave formation may initiate prior to surface damage on ZnSe and Al foil, whereas damage occurs first on Plexiglas. GRA

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N75-25185* National Aeronautics and Space Administration. Pasadena Office, Calif.
ULTRASONICALLY BONDED VALUE ASSEMBLY Patent
Richard J. Salvinski, inventor (to NASA) (TRW Systems Group, Redondo Beach, Calif.) Issued 1 Apr. 1975 7 p Filed 28 Sep. 1973 Supersedes N74-20073 (12 - 11, p 1298) Sponsored by NASA
(NASA-Case-NPO-13360-1; US-Patent-3,874,635; US-Patent-Appl-SN-401920; US-Patent-Class-251-333; US-Patent-Class-228-1) Avail: US Patent Office CSCL 13G

A valve apparatus capable of maintaining a fluid-tight seal over a relatively long period of time by releasably bonding a valve member to its seat is described. The valve member is bonded or welded to the seat and then released by the application of the same energy to the bond joint. The valve member is held in place during the bonding by a clamping device. An appropriate force device can activate the opening and closing of the valve member. Various combinations of material for the valve member and valve seat can be utilized to provide an adequate sealing bond. Aluminum oxide, stainless steel, inconel, tungsten carbide as hard materials and copper, aluminum, titanium, silver, and gold as soft materials are suggested.
Official Gazette of the U.S. Patent Office

N75-25186* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HOLE CUTTER Patent
George E. Thornton and Danvis T. Newby, inventors (to NASA) Issued 15 Apr. 1975 5 p Filed 19 Sep. 1973 Supersedes N73-32376 (11 - 23, p 2797)
(NASA-Case-MFS-22649-1; US-Patent-3,877,833; US-Patent-Appl-SN-398901; US-Patent-Class-408-186; US-Patent-Class-408-112; US-Patent-Class-408-193; US-Patent-Class-408-195) Avail: US Patent Office CSCL 131

An adjustable hole cutter is described for use in forming circular openings in workpieces. The hole cutter is characterized by a mount of a substantially planar configuration, positionable into a plane paralleling the working plane of a selected workpiece. It also contains a shaft for imparting rotary motion to the mount about an axis of rotation normally related to the working plane, a plurality of stabilizing struts for resiliently supporting the mount in parallelism with the working plane as rotary motion is imparted thereto, a drill bit for drilling a pilot hole concentric with the axis of rotation, and an elongated cutting tool adjustably seated within a radially extended slot.
Official Gazette of the U.S. Patent Office

N75-25187 British Library Lending Div., Boston Spa (England).
CONTRIBUTION TO DETERMINING THE STABILITY OF MULTI-BEARING SHAFTS
H. Borgmann 14 May 1974 19 p refs Transl. into ENGLISH from VDI Berichte (Dusseldorf), no. 135, 1969 p 125-130
(BLL-CE-Trans-5970-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Instability phenomena of rotating shafts in plain multi-bearings are investigated using transfer matrix calculations. Determinations were also made of stability limits, corresponding natural frequencies, and the stability reserve. Data are also given on the effects of thrust bearings, forces from oil films, and elastic and inertia properties on the shaft. E.H.W.

N75-25188*# Creare, Inc., Hanover, N.H.
AERODYNAMIC AND MECHANICAL DESIGN OF AN 8:1 PRESSURE RATIO CENTRIFUGAL COMPRESSOR
Colin Osborne, Peter W. Runstadler, Jr., and W. Dodd Stacy Apr. 1974 146 p refs
(Contract NAS3-17848)
(NASA-CR-134782; Creare-TN-204) Avail: NTIS HC $5.75 CSCL 21E

A high-pressure-ratio, low-mass-flow centrifugal compressor stage was designed, fabricated, and tested. The design followed specifications that the stage be representative of state-of-the-art performance and that the stage is to be used as a workhorse compressor for planned experiments using laser Doppler velocimeter equipment. The final design is a 75,000-RPM, 19-blade impeller with an axial inducer and 30 degrees of backward leaning at the impeller tip. The compressor design was tested for two- and/or quasi-three-dimensional aerodynamic and stress characteristics. Critical speed analyses were performed for the high speed rotating impeller assembly. An optimally matched, 17-channel vane island diffuser was also designed and built. Author

N75-25189# Pisa Univ. (Italy).
CHARACTERISTIC COEFFICIENTS OF HYDROSTATIC PADS FOR VARIOUS SHAPES [COEFFICIENTI CARATTERISTICI DI PATTINI IDROSTATICI DI FORME DIVERSE]
R. Bassani and C. Culla 1973 29 p refs In ITALIAN
(Rept-1532) Avail: NTIS HC $3.75

Data concerning the values of coefficients characteristic of the carrying capacity for fluids, and the power dissipated by hydrostatic pads are presented. The high precision values which were obtained by numerical calculation are presented as functions of the bearing geometry. Transl. by F.O.S.

N75-25190# Joint Publications Research Service, Arlington, Va.
MECHANIC'S HANDBOOK ON DEEP DRILLING
Ye. A. Palashkin 19 May 1975 46 p refs Transl. into ENGLISH from the book "Spravochnik Mekhanika po Glubokomu Bureniyu" Moscow, Izd. Nedra p 2-29, 539-544

(JPRS-64789) Avail: NTIS HC $3.75
A description of the fundamentals in the study of metal and nonmetal materials used in manufacturing and repairing drilling equipment is given. Author

N75-25191*# Mechanical Technology, Inc., Latham, N.Y.
EVALUATION OF A SERIES HYBRID THRUST BEARING AT DN VALUES TO THREE MILLION. 2: FABRICATION AND TESTING Final Report
M. Eusepi and L. W. Winn Washington NASA Jun. 1975 46 p refs
(Contract NAS3-16740)
(NASA-CR-2542; MTI-75TR19) Avail: NTIS HC $3.75 CSCL 13I

Results of tests made to determine the experimental performance of a series hybrid bearing are reported. The bearing consists of a 150 mm ball bearing and a centrifugally actuated, conical, fluid film bearing fitting an envelope with an outer radius of 86.4 mm (3.4 in.) and inner radius of 71 mm (2.8 in.). Tests were conducted up to 16,500 rpm, at which speed an axial load of 15,568 N (3500 lb) was safely supported by the hybrid bearing system. Through the employment of the series hybrid bearing principle, it was possible to reduce the effective ball bearing speed to approximately one-half of the shaft speed. A reduction of this magnitude should result in a tenfold increase in the ball bearing fatigue life. A successful simulation of fluid film bearing lubricant supply failure, performed repeatedly at an operating speed of 10,000 rpm, resulted in complete and smooth change over to full scale ball bearing operation when the oil supply to the fluid film bearing was discontinued. Reactivation of the fluid film supply system produced a flawless return to the original mode of hybrid operation. Author

N75-25192*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXPERIMENTALLY DETERMINED STIFFNESS AND DAMPING OF AN INHERENTLY COMPENSATED AIR SQUEEZE-FILM DAMPER
Robert E. Cunningham Washington Jun. 1975 32 p refs
(NASA-TN-D-7987; E-8207) Avail: NTIS HC $3.75 CSCL 13I

Values of damping and stiffness were determined experimentally for an externally pressurized, inherently compensated, compressible squeeze-film damper up to excitation frequencies of 36,000 cycles per minute. Experimental damping values were higher than theory predicted at low squeeze numbers and less than predicted at high squeeze numbers. Experimental values of air film stiffness were less than theory predicted at low squeeze numbers and much greater at higher squeeze numbers. Results also indicate sufficient damping to attenuate amplitudes and forces at the critical speed when using three dampers in the flexible support system of a small, lightweight turborotor. Author

N75-25193# Sandia Labs., Albuquerque, N.Mex.
SANDIA LABORATORIES TECHNICAL CAPABILITIES: MATERIALS AND PROCESSES
Feb. 1975 37 p
(Contract AT(29-1)-789)
(SAND-74-0073A) Avail: NTIS HC $3.75

The activities which provide the basis for the materials and processes capabilities within Sandia Laboratories are described. Selected applications of these capabilities are presented to illustrate the extent to which they can be applied in research and development programs. Author (NSA)

N75-25194# Central Electricity Generating Board, Berkeley (England). Nuclear Labs.
METHOD OF PRODUCING ARTIFICIAL LEAKS
A. R. Pugh, D. M. J. Rowe, and R. J. Smith Oct. 1974 7 p
(RD/B/N-3120) Avail: ERDA Depository Libraries HC $4.00

A method is described of preparing small artificial leaks in stainless steel material. A hole is drilled axially in a bar which is then swaged down in a hammer mill. In this process the drilled hole collapses on itself. After subsequent treatment a stable leak is produced the size of which is related to the extent of swaging. The long term stability of the leaks is excellent. Author (NSA)

N75-25195# Aerospace Corp., El Segundo, Calif.
PARAMETERS INFLUENCING THE PROPERTIES OF BRITTLE COATINGS Interim Report
Seichi Okubo and Ching H. Tsao 21 Mar. 1975 26 p refs
(Contract F04701-74-C-0075)
(AD-A008511; TR-0075(5240-10)-4; SAMSO-TR-75-93) Avail: NTIS CSCL 11/3

A summary of 34 of the 40 major parameters that influence the properties of the lacquer-type brittle coatings is presented. The studies of the parameters were conducted primarily during the 1940's and early 1950's by Durelli and co-workers under his direction. A few of the major parameters are discussed. Experimental data related to reformulated Stresscoat and a new commercial brittle coating called Tens-Lac are shown. Some recommended procedures are given for obtaining optimum brittle coating data as suggested from the parametric studies. GRA

N75-25196# Virginia Univ., Charlottesville. Research Labs. for the Engineering Sciences.
HIGH SPEED ROTOR BALANCING Final Report
Walter D. Pilkey 1974 10 p refs
(Grant DA-ARO(D)-31-124-72-G132)
(AD-A008409; RLES-ESS-3336-101-75; ARO-10257.8-E) Avail: NTIS CSCL 13/9

This report summarizes the accomplishments of a study exploring new methods for balancing and designing flexible rotating shafts. Balancing is treated as an optimization problem suitable for computational solution. Techniques are considered which permit the magnitude of the balance weights chosen to lie within practical bounds. One method will suppress the rotor response at speeds higher than those that can be safely negotiated without balancing. An approach is developed for computing the sensitivity of dynamic systems to uncertain loadings. Efficient rotor design schemes are also set forth. GRA

N75-25197# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
HOW TO CONNECT THE UNCONNECTED
V. Blyumkin 19 Feb. 1975 11 p Transl. into ENGLISH from Nauka Tekn. (USSR), no. 10, Oct. 1972 p 39-41
(FTD Proj. T74-01-40; FTD Proj. T74-01-41)
(AD-A007930; FTD-HT-23-0963-75) Avail: NTIS CSCL 13/8

The article discusses new types of welding of heterogeneous metals. GRA

N75-25198# Wear Sciences, Inc., Schenectady, N.Y.
EFFECT OF BORIDING ON BEARING WEAR AND LUBRICATION
S. F. Murray Jan. 1975 31 p refs
(Contract DAAA-74-M-0773)
(AD-A007925; WVT-CR-75004) Avail: NTIS CSCL 13/9

A study is being made to determine the feasibility of improving the wear and erosion resistance of gun barrels by the use of boride coatings on the steel surfaces. As one part of this work, an experimental investigation was made of the friction and wear characteristics of boride-coated steel sleeve bearings operating in the boundary region of lubrication. Evaluation tests were run at slow speeds under various loading conditions to determine the sliding behavior of plain, borided sleeve bearings running against hardened tool steel shafts. These tests were run under three conditions: dry, lubricated with an SAE 10W petroleum oil, and lubricated with an SAE 10W oil which contained known quantities of silica as an abrasive. For comparison, steel bearings which had not been exposed to the boriding process were also evaluated. GRA

N75-25199# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PERFECTING THE PROCESS OF PRODUCING THIN-WALLED CASTINGS FROM WAX MODELS USING CERAMIC CORES
D. Ya. Bragin and I. P. Goldfarb 12 Feb. 1975 12 p Transl. into ENGLISH from the book "Spetsialnye sposoby litya" USSR, 1971 p 203-207
(AD-A007941; FTD-HT-23-0908-75) Avail: NTIS CSCL 13/8

Optimal conditions for producing complex hollow cast blades for gas turbine engines are discussed along with the selection of ceramic core composition. Features are described for the technological production process of hollow and cooled blades using ceramic cores. M.J.S.

N75-25200# Merchant Marine Academy, Kings Point, N.Y.
APPLICATION OF SUPERCONDUCTING ELECTRICAL MACHINERY TO THE PROPULSION SYSTEMS OF COMMERCIAL VESSELS
David C. Hicks Oct. 1974 66 p refs
(COM-75-10137; NMRC-KP-115) Avail: NTIS HC $4.25 CSCL 13J

The classical problem of the need for a high power density transmission system is investigated. Proposed solutions using gas turbines and superconducting machinery are analyzed. The general advantages and disadvantages of conventional and superconducting electrical transmission systems are presented with verification of conclusions obtained using existing operational systems. The system analysis includes the machine system, its feasibility, and economic cost benefits for the present maritime industry needs. A final experimental system is proposed based on the conclusions obtained from this investigation. GRA

N75-25201# Mitsubishi Heavy-Industries Ltd., Tokyo (Japan).
A THERMO-ELASTIC ANALYSIS OF THE PARALLEL SURFACE THRUST BEARING
Susumu Taniguchi Dec. 1974 16 p refs
(PB-239524/2; MTB-95) Avail: NTIS HC $3.25 CSCL 13I

An optical interferometric technique was used to display the distorted film shape in nominally parallel surface thrust bearing. The test bearings of different basic thickness were made of aluminum to accentuate thermal expansion and were carefully lapped flat before use. In addition, a full theoretical computer analysis was carried out to solve the Reynolds and energy equations together with the elasticity equation, which was derived from a modified two-dimensional finite element method. Both experimental and theoretical results confirm that these bearings operate by the thermal formation of a slightly converging wedge-shaped film over the leading 80 per cent of the pad. GRA

N75-25202# Mitsubishi Heavy-Industries Ltd., Tokyo (Japan).
APPLICATION OF WELD FORMING TECHNIQUE TO MANUFACTURING OF AUSTENITIC STAINLESS STEEL ELBOW FOR NUCLEAR POWER PLANT SERVICE
Dec. 1974 20 p refs In CHINESE; ENGLISH summary
(PB-239525/9; MTB-96) Avail: NTIS HC $3.25 CSCL 13H

To apply austenitic stainless steel pipes manufactured by the weld forming technique to the main coolant pipes of the light water reactor of the nuclear power plant, metallurgical, mechanical, and other data required for the approval of new materials are presented. The elbow models of actual size manufactured by the weld forming technique were used. This paper introduces the various data acknowledged to be well applicable to the main coolant pipes of the light water reactor and also various data for the manufacture of weld formed elbows. GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N75-25203 British Library Lending Div., Boston Spa (England).
THE USE OF THE TERMS NEARFIELD AND FARFIELD IN ULTRASONIC NON-DESTRUCTIVE TESTING
U. Schlengermann [1974] 17 p refs Transl. into ENGLISH from Materialpruefung (West Germany), v. 15, no. 5, May 1973 p 161-166
(BLL-CE-Trans-6484-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

An attempt to eliminate confusion and to define sound field terminology is made. Definitions, equations, and examples are given for the following terms and expressions: sound radiation from a probe; plane wave or spherical wave; interference; relative isobars; reflector effect near and far field in reflection operation; and, field delimitation. Author

N75-25204# Communications Research Centre, Ottawa (Ontario).
THE COMPUTER ANALYSIS OF CW SCATTEROMETER DATA WITH PARTICULAR REFERENCE TO THE RYAN MODEL 720 SYSTEM
G. M. Royer Mar. 1975 69 p refs
(CRC-R-1265) Avail: NTIS HC $4.25

Scatterometer data were analyzed to obtain the normalized backscatter coefficient, sigma sub O, a variable much used in radar theory to express the scattering properties of terrain. The equations which are required to analyze CW scatterometer data are developed. Errors in the computed values for sigma sub O are investigated as functions of imperfections arising in practical scatterometer systems. Also when computing sigma sub O it is necessary to know certain system characteristics precisely, and measurements of these characteristics for the Ryan model 720 system are presented. Author

N75-25205*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TECHNIQUES OF FINAL PRESEAL VISUAL INSPECTION
Robert J. Anstead Washington 1975 63 p refs
(NASA-SP-6509) Avail: NTIS HC $4.25 CSCL 09E

A dissertation is given on the final preseal visual inspection of microcircuit devices to detect manufacturing defects and reduce failure rates in service. The processes employed in fabricating monolithic integrated circuits and hybrid microcircuits, various failure mechanisms resulting from deficiencies in those processes, and the rudiments of performing final inspection are outlined. Author

N75-25206# Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).
ULTRASONIC THICKNESS MEASUREMENT FOR CORROSION CONTROL IN CHEMICAL PLANT
L. X. Nepomuceno and M. F. Barbosa 11 Nov. 1974 15 p In PORTUGUESE; ENGLISH summary
(Rept-7411.737) Avail: NTIS HC $3.25

The use of ultrasonic thickness measurements to detect corrosion in nitric acid pressure vessels is discussed. The equipment and procedures are described, and the data obtained are indicated on schematic diagrams. Author

N75-25207# Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).
CORROSION CONTROL OF HIGH PRESSURE TUBULATION IN GAS GENERATING PLANT THROUGH ULTRASONIC THICKNESS MEASUREMENT
L. X. Nepomuceno, L. C. Giannini, and G. Molina 4 Oct. 1974 10 p In PORTUGESE; ENGLISH summary
(Rept-7409.730) Avail: NTIS HC $3.25

The inspected components, equipment, accessories, and the procedures are described. The results are presented in schematics indicating the thickness. Author

N75-25208# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FORECASTS IN AUTOMATION AND MEASUREMENT TECHNOLOGY
D. Shtriker 18 Oct. 1974 11 p Transl. into ENGLISH from the book "Teoriya i Praktika Prognozirovaniya Razvitya Nauki i Tekhniki v Stranakh-Ghienakh Sev" Moscow, 1971 p 301-304
(AD-A000623; FTD-HT-23-2366-74) Avail: NTIS CSCL 14/2

An overview of the development of automation techniques in the area of measurement is given. Emphasis is placed on the growing relationship among instrument engineering, automation, and computer technology. Factors which will affect the further development of automation technology are defined. J.M.S.

N75-25209# Southwest Research Inst., San Antonio, Tex.
DEVELOPMENT OF NONDESTRUCTIVE INSPECTION EQUIPMENT FOR JET ENGINE COMPRESSOR BLADES
Final Report, 21 Aug. 1973 - 31 Jan. 1975
W. D. Perry, H. S. Silvus, and J. R. Barton Feb. 1975 59 p refs
(Contract DAAJ01-73-C-0881)

(AD-A008273; SwRI-15-3707; USAAVSCOM-TR-73-19) Avail: NTIS CSCL 13/8

The report presents the results of a program to develop a prototype system to semi-automatically inspect compressor blades using the stress enhanced ultrasonic methol. Several preliminary experiments and design evaluations were completed. A prototype system was constructed to inspect the first and second stage compressor blades of the T53-L13B jet engine. This unit was evaluated and successfully demonstrated. Recommendations are presented for further development of the prototype equipment and implementation of the inspection system. GRA

N75-25210# Naval Postgraduate School, Monterey, Calif.
RELIABILITY ANALYSIS OF PHASED MISSIONS
J. D. Esary and H. Ziehms Feb. 1975 28 p refs
(AD-A008290; NPS-55EY-75021) Avail: NTIS CSCL 14/4

In a phased mission the relevant system configuration (block diagram or fault tree) changes during consecutive time periods (phases). Many systems are required to perform phased missions. A classic example is a space vehicle. A reliability analysis for a phased mission encounters complexities not present with just one phase, but can be transformed into an analysis of a synthetic single phase case. The transformation has a potential for direct application, or can be used to study various computational algorithms and approximations. GRA

N75-25211# Radio Corp. of America, Somerville, N.J.
RELIABILITY EVALUATION OF C/MOS TECHNOLOGY IN COMPLEX INTEGRATED CIRCUITS Interim Report, 8 May 1973 - 30 Sep. 1974
Charles Whelan Feb. 1975 90 p
(Contract F30602-73-C-0282; AF Proj. 5519)
(AD-A008524; RADC-TR-75-62) Avail: NTIS CSCL 09/5

The objective of the study is to investigate reliability on small and medium scale C/MOS integrated circuits. Four manufacturers gates and three manufacturers shift registers are included. The effects of burn-in and stress tests on the devices are being evaluated. One aspect of this work involved an analysis of the structural differences between various manufacturing versions of devices bearing the same type designation, so that the possible effect of the variations on device reliability could be determined. Information contained in this report indicates structural differences between manufacturers: devices and indications of sequence of burn-in effects on the generation of failures. The evaluation reveals no serious device problems on initial stress tests and the failures which did occur revealed only anticipated mechanisms at this point in the testing schedule. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N75-25212 British Library Lending Div., Boston Spa (England).
FATIGUE CRACK GROWTH MEASUREMENT USING THE ELECTRICAL POTENTIAL METHOD
U. Betz 25 Jul. 1974 11 p ref Transl. into ENGLISH from Materialpruefung (Dusseldorf), v. 14, no. 3, Mar. 1972 p 73-77
(BLL-CE-Trans-6016-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The development of a multiple measuring device is reported which is capable of determining crack depths at several adjacent lokations during fatigue cracking. First results obtained on different specimens, some tested at elevated temperatures, are discussed. The method is applicable only to specimens with a defined crack starter (notch or precrack). Author

N75-25213*# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.
THE EFFECT OF BENDING ON THE STRESSES IN ADHESIVE JOINTS
U. Yuceoglu and D. P. Updike Mar. 1975 40 p refs
(Grant NGR-39-007-011)
(NASA-CR-142902; IFSM-75-68) Avail: NTIS HC $3.75 CSCL 20K

The problem of stress distribution in adhesive joints where two orthotropic plates are bonded through a flexible adhesive layer is analyzed. It is shown that the effect of bending of the adherends on the stresses in the adhesive layer is very significant. The transverse shear deformations of the adherends appear to have little influence on the adhesive layer stresses. The maximum transverse normal stress in the adhesive is shown to be larger than the maximum longitudinal shear stress. The method of solution is applied to several examples of specific joint geometries and material combinations, and is proven to be applicable to other related problems. Author

N75-25214*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SEPARATION OF THE STRAIN COMPONENTS FOR USE IN STRAINRANGE PARTITIONING
S. S. Manson (Case-Western Reserve Univ.), G. R. Halford, and A. J. Nachtigall 1975 47 p Presented at Pressure Vessels and Piping Conf., San Francisco, 23-27 Jun. 1975; sponsored by ASME
(NASA-TM-X-71737) Avail: NTIS HC $3.75 CSCL 20K

Two methods are presented for separating the inelastic strain components of a complex hysteresis loop so that strainrange partitioning formulas can be applied to accurately determine cyclic life at elevated temperatures. These methods are required only if lower bounds established by strainrange partitioning concepts have been deemed inadequate in the establishment of expected lifetime. In one method, rapid loading and unloading is applied in the tensile and compressive half to isolate the plastic strain. In the second method, the creep is measured at a discrete number of points along the hysteresis loop by combining load-control tests into the general pattern of strain cycling under arbitrary temperature. Both methods are shown to give good results. Author

N75-25215*# Kanner (Leo) Associates, Redwood City, Calif.
A STUDY OF UNSTEADY VIBRATIONS OF PLATES MADE OF VISCOELASTIC MATERIAL
N. M. Borodachev and A. A. Gilman Washington NASA Jun. 1975 12 p refs Transl. into ENGLISH from the book "Rasprotaneniye Uprigikh i Uprogoplasticheskikh Voln" Alma-Ata, Nauka Kazakhskoy SSR Press, 1973 p 95-101
(Contract NASw-2481)
(NASA-TT-F-16391) Avail: NTIS HC $3.25 CSCL 20K

A method for studying the unsteady vibrations of viscoelastic plates is proposed. Their general behavior, the transverse vibrations of a rectangular viscoelastic plate of constant thickness, the properties of a plate with severely pinched contours, and two examples are analyzed. The two examples concern the action of a uniformly distributed load applied suddenly, with analysis of both the Voigt and Maxwell models, and a rectangular plate hinged along the circumference. The effect of a concentrated force on the plate was investigated. Author

N75-25216# Mitsubishi Heavy-Industries Ltd., Tokyo (Japan).
FATIGUE STRENGTH OF WELDED TUBULAR JOINTS IN OFFSHORE STRUCTURES
Susuma Teramoto (Hiroshima Tech. Inst.), Tetsuro Kawasaki (Hiroshima Tech. Inst.), Shoji Kaminokado (Hiroshima Tech. Inst.), and Masaaki Matoba (Nagasaki Tech. Inst.) Apr. 1975 21 p refs
(Bull-100) Avail: NTIS HC $3.25

Experiments and analyses for a study on fatigue strength of tubular joints generally used for column stabilized drilling units or drilling platforms on the sea were performed. The fatigue strength of joints under complicated stresses and the most effective type of joint to employ are presented. The static and fatigue tests with regard to the essential factors of structure design using 22 typical scale-down models consisting of 8 different types of tubular joints are shown. The conclusions of the study are: (1) the diaphram reinforced tubular joint is more effective than the ring stiffener reinforced type for the prevention of fatigue crack initiation, and the reduction of crack propagation; (2) the right angle tubular joint is stronger in resistance against fatigue

crack initiation than the oblique angle type; and (3) a good correlation is obtained between the fully reversed strain controlled fatigue test results on the basic specimens and the displacement controlled fatigue test results on the scale-down models.
Author

N75-25217# Pisa Univ. (Italy).

EXPERIMENTAL RESEARCH, USING A MODEL, OF THE STATE OF TENSION OF THE UPPER CLOSURE PLATE OF A NUCLEAR VESSEL [RICERCA SPERIMENTALE, PER MEZZO DI UN MODELLO, DELLO STATO DI TENSIONE DELLA PIASTRA SUPERIORE DI CHIUSURA DI UN CONTENITORE NUCLEARE]

G. Nerli 1972 35 p refs In ITALIAN
(Rept-1529) Avail: NTIS HC $3.75

Results are presented of work with a pressure vessel which is used in reactor safety research. The results for the external and internal tension for two reinforced openings are summarized.
Transl. by F.O.S.

N75-25218*# Universal Analytics, Inc., Los Angeles, Calif.

THE NASTRAN SRB SLAPDOWN WATER IMPACT ANALYSIS Final Report

D. N. Herting 12 May 1975 150 p refs
(Contract NAS8-29665)
(NASA-CR-143862) Avail: NTIS HC $5.75 CSCL 20K

A computer analysis was made of the hydroelastic interaction between a shell structure representing the space shuttle solid rocket motor case and an incompressible fluid during the slapdown phase of water impact. The large motions and hydroelastic response of the system were obtained by numerical integration of the combined hydrodynamics and structural equations of motion and are analyzed for a selected interval after the initial nozzle impact. The computerization of the slapdown hydroelastic capability was incorporated into the general purpose NASTRAN computer code. The development of the theoretical basis, a guide to the program's usage, results of correlation and parameter studies, and a detailed description of the computer code are also included.
Author

N75-25219# Southampton Univ. (England). Inst. of Sound and Vibration Research.

PATH IDENTIFICATION IN NONDISPERSIVE MEDIA BY CROSS CORRELATION: EFFECTS OF NOISE AND ERROR ANALYSIS

G. Pavic Dec. 1974 73 p refs
(ISVR-TR-52) Avail: NTIS HC $4.25

The influence of noise on cross correlation measurements on built-up structures is investigated. The problem of transmission path identification and characterization is studied by the examination of the forms of cross correllograms between the excitation and response of various types of system subjected to several external disturbances. Results are obtained which provide the basis for determining the necessary experimental technique and test parameters and for interpreting the results when noise is present. Finally the practical applicability of the method studied is discussed.
Author

N75-25220*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.

OPTIMIZATION OF STRUCTURES UNDERGOING HARMONIC OR STOCHASTIC EXCITATION Ph.D. Thesis

Erwin Harry Johnson Jun. 1975 190 p refs
(Grant NGL-05-020-243)
(NASA-CR-142936) Avail: NTIS HC $7.00 CSCL 20K

The optimal design was investigated of simple structures subjected to dynamic loads, with constraints on the structures' responses. Optimal designs were examined for one dimensional structures excited by harmonically oscillating loads, similar structures excited by white noise, and a wing in the presence of continuous atmospheric turbulence. The first has constraints on the maximum allowable stress while the last two place bounds on the probability of failure of the structure. Approximations were made to replace the time parameter with a frequency parameter. For the first problem, this involved the steady state response, and in the remaining cases, power spectral techniques were employed to find the root mean square values of the responses. Optimal solutions were found by using computer algorithms which combined finite elements methods with optimization techniques based on mathematical programming. It was found that the inertial loads for these dynamic problems result in optimal structures that are radically different from those obtained for structures loaded statically by forces of comparable magnitude.
Author

N75-25221*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

CRACK GROWTH UNDER SPECTRUM LOADING: A CRACK CLOSURE MODEL

Wolf Elber [1975] 23 p refs Presented at the Symp. of Fatigue Crack Growth Under Spectrum Loading, 78th Ann. ASTM Meeting
(NASA-TM-X-72708) Avail: NTIS HC $3.25 CSCL 20K

A concept based on the crack-closure phenomenon was developed to replace random load spectra with constant amplitude loading in both analysis and tests. The maximum load and the crack opening load in the constant amplitude loading are chosen to be equal to those for the spectrum, so that both crack growth mode and the crack length at failure are equivalent to those under random load spectra. The number of cycles of constant-amplitude loading is chosen so that the amount of crack growth is equal to that due to a given sequence or block of the random spectrum loading. The concept was tested experimentally after predicting the equivalent number of constant-amplitude cycles for six different random load sequences. The agreement between predictions and test results was good.
Author

N75-25222+ Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 469

27 Jun. 1975 21 p refs Transl. into ENGLISH from East European journals of 1974 and 1975
(JPRS-65100) Avail: NTIS HC $3.25

An approximative method is reported for calculating wall thickness and crumpling of vacuum tubing in the sugar industry due to wear. This wear of vacuum tubing during the sugarbeet season is caused by corrosive action of ammonia gases, oxygen and carbon dioxide in combination with steam and water mixtures at temperatures above 80 C developing during boiling of the sugar pulp. The method considers the linear modulus of deformation as well as the stress under which the vacuum tube wall operates.
G.G.

N75-25223# Oak Ridge Y-12 Plant, Tenn.

THERMAL STRESS TESTING SYSTEM FOR GRAPHITIC MATERIALS

P. C. Turner 30 Dec. 1974 28 p refs
(Contract W-7405-eng-26)
(Y-DA-6003) Avail: NTIS HC $3.75

A system was needed for precisely measuring and recording four parameters for thermal stress testing of graphitic materials. For this test, a disc sample is thermally stressed by applying an electric arc to its center. By measuring and recording arc voltage, arc current, sample peripheral temperature, and sample radial expansion, the system provides data for determining the relative thermal stress resistance and the coefficient of thermal expansion for each sample. To provide these capabilities, a digital recording system was developed.
Author (NSA)

N75-25224# Central Electricity Generating Board, Berkeley (England). Nuclear Labs.

FATIGUE CRACK PROPAGATION DUE TO RANDOM AMPLITUDE VIBRATIONS: THE INFLUENCE OF STRESS INTENSITY MEAN ON PROPAGATION RATE

E. K. Priddle Sep. 1974 18 p refs
(RD/B/N-3097) Avail: ERDA Depository Libraries HC $4.00

A mild steel was subjected to random amplitude loadings at room-temperature to investigate the growth of fatigue cracks. The process of crack propagation under various mean loading conditions is described and predicted by conventional fracture mechanics parameters. Fracture surfaces of specimens were examined and compared with surfaces produced during constant amplitude propagation.
Author (NSA)

N75-25225# Bettis Atomic Power Lab., Pittsburgh, Pa.
THERMAL STRESSES ON THE SURFACE OF PERFORATED PLATES WITH TEMPERATURE DISTRIBUTIONS VARYING THROUGH THE THICKNESS ONLY
D. P. Jones Dec. 1974 41 p refs
(Contract AT(36-1)-GEN-14)
(WAPD-TM-1190) Avail: NTIS HC $3.75

Numerical finite element solutions for the thermoelastic stresses near penetrations in plates are presented. Consideration was given to both plates with a single penetration and to plates containing a uniform array of penetrations arranged in a triangular pattern. Results are given for thermal shock, linear temperature distribution through the thickness, and quadratic temperature distribution through the thickness. For the plates subjected to thermal shock, no stress concentration is found at the penetration boundary. The thermal stresses at the surface of perforated plates subjected to linear and nonlinear temperature gradients through the thickness are found to vary around the ligament edges in the same manner as the stresses induced by equivalently applied mechanical loads. Author (NSA)

N75-25226# California Univ., Livermore. Lawrence Livermore Lab.
STOCHASTIC FINITE ELEMENT SIMULATION OF THE NONLINEAR STRUCTURAL RESPONSE OF FIBROUS COMPOSITE MATERIALS Ph.D. Thesis
R. A. Larder 15 Jan. 1975 98 p refs
(Contract W-7405-eng-48)
(UCRL-51717) Avail: NTIS HC $4.75

The development of a statistical simulation applicable to unidirectional fiber composites is described and several examples are given. The finite element method was used to perform a number of nonlinear simulations in which the strength of individual fibers is varied randomly along its length in accordance with a simple model of faults. The lowest strength fiber in the model is identified, and a series of linear elastic problems are solved. Failure is subsequently determined by both the strength variation and the stress concentration effects as various fiber failures occur throughout the model. As the fibers continue to fail in a random manner, the failure stress of the entire model can be estimated by observing the number of fiber failures per load increment. The number of failures per load increment increases slowly at first until a cascading effect abruptly increases the number of failures causing failure of the entire model. The application of a deterministic 3-dimensional finite element analysis to the micromechanics of nonparallel fiber structures is discussed. Author (NSA)

N75-25227# Sandia Labs., Albuquerque, N.Mex.
MEASUREMENT OF RESIDUAL STRESSES IN AN ALUMINUM CYLINDER PLATED WITH THICK NICKEL-COBALT ALLOY
J. W. Dini, G. A. Benedetti, and H. R. Johnson Jan. 1975 25 p refs
(Contract AT(29-1)-789)
(SAND-74-8510) Avail: NTIS HC $3.25

A hole drilling technique and its related analysis were used to determine the principal residual stresses in an aluminum cylinder plated with thick nickel-cobalt alloy. The residual stresses obtained with this technique agreed quite well with those measured by the rigid strip method. Author (NSA)

N75-25228# Royal Netherlands Shipowners Association, The Hague.
FURTHER ANALYSIS OF WAVE-INDUCED VIBRATORY SHIP HULL BENDING MOMENTS
F. F. VanGunsteren Mar. 1974 17 p refs Prepared for Ned. Scheepstudiecentrum INO
(Rept-191-S; TDCK-65700) Avail: NTIS HC $3.25

The calculation of wave-induced ship hull vibrations by application of the normal mode method and calculation of the vibratory bending moment are discussed. Wave excitation, added mass, and hydrodynamic damping associated with wave-induced ship hull vibrations are described. Calculated results for two Great Lakes bulk carrier models, consisting of two rigid halves, are discussed and compared with measured results. ESRO

N75-25229# Ballistic Research Labs., Aberdeen Proving Ground, Md.
AN ANALYSIS OF FINITE ELEMENT CODE TORT 2 Final Memorandum Report
John Carson and W. H. Drysdale Mar. 1975 18 p
(DA Proj. 1T6-62618-AH-80)
(AD-A008319; BRL-MR-2463) Avail: NTIS CSCL 20/11

A study is performed of the TORT 2 finite element code for the solution of axisymmetric torsion problems. Various element formulations are reviewed and recommendations for best use of the code are made. The nonvanishing of surface shears on stress free surfaces is considered. Finally, an error in the contractor supplied sample problem is examined and a rule for avoiding similar difficulties explained. GRA

N75-25230# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CALCULATING ULTIMATE STRENGTH OF WELDED JOINT OF THIN, HIGH-STRENGTH STEEL SHEET AS A FUNCTION OF DISPLACEMENT IN GROOVE FACES
S. B. Makhanov 19 Feb. 1975 13 p refs Transl. into ENGLISH from Tr. Korablestroitelnyi Inst. (Leningrad), no. 79, 1972 p 95-99
(AD-A007935; FTD-HT-23-0962-75) Avail: NTIS CSCL 13/5

Specimens with a transverse welded seam were tested to determine the effect of displacements in the groove face on the ultimate weld strength. The decline in the welded joint's strength may be caused by a decrease in the cross section of the seam, development of tensile force bending moment, and stress concentrations in the area between the seam reinforcement and the base metal. M.J.S.

N75-25231# Forest Products Lab., Madison, Wis.
STRESSED-SKIN PANEL: DEFLECTIONS AND STRESSES
Edward W. Kuenzi and John J. Zahn 1975 45 p refs
(AD-A007917; FSRP-FPL-251) Avail: NTIS CSCL 13/13

The paper presents a mathematical analysis based on shear flow and shear lag theories to determine deflections and stresses for stressed-skin panels wherein skins are rigidly bonded to stringers. Experimental examination of several panel constructions showed that the analysis can provide a rational basis for the design of stressed-skin panels. Designs based on the analysis will result in more efficient use of materials. GRA

N75-25232# Texas Univ., Austin.
FRACTURE OF FIBER REINFORCED BEAMS DUE TO IMPACT LOADING Final Report
C. H. Yew and B. K. Benedict Mar. 1975 27 p refs
(Contract DAAD05-73-C-0024; DA Proj. 1T0-61102-A-33E)
(AD-A008078; BRL-CR-212) Avail: NTIS CSCL 13/13

Experimental studies were made on the dynamic failure of graphite/epoxy fiber reinforced beams of three different angle ply laminates. The cantilevered beam specimens were impacted with tip velocities ranging from 1 ft/sec to 20 ft/sec. Various aspects of the failure of the different types of beams were noted. GRA

N75-25233# Massachusetts Univ., Amherst. Energy Alternatives Program.
SPHERICAL AND CYLINDRICAL HULLS OF REINFORCED CONCRETE
Elmer C. Osgood Aug. 1973 24 p
(Grant NSF GI-34979)
(PB-239366/8; NSF/RANN/SE/GI-34979/TR-73-14; NSF/RA/N-73-138) Avail: NTIS HC $3.25 CSCL 20K

This paper investigates the feasibility and practicality of using reinforced concrete for the construction of spherical and cylindrical hulls to enclose submerged atomic power plants. The stresses of a spherical shell, which is submerged in water and loaded for neutral buoyancy, are analyzed. Membrane stress theory is applied to determine the stresses for the three types of loads (water pressure, weight of shell, and internal or imposed load) and type of shell assumed. Mathematical expressions are derived for the membrane stresses for both the upper and lower hemispheres of the sphere. Using the working stress method, the safe strength of reinforced concrete is calculated to be 1103 k/ft. GRA

42 GEOSCIENCES (GENERAL)

N75-25234+ Joint Publications Research Service, Arlington, Va.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 351
30 Jun. 1975 70 p refs Transl. into ENGLISH from Russian articles on meteorology, oceanography, upper atmosphere and space research, and astronomy and terrestrial geophysics
(JPRS-65118) Avail: NTIS HC $4.25

Translations and abstracts are presented of articles on meteorology, oceanography, upper atmosphere and space research, astronomy, and terrestrial geophysics, covering both science news and formal scientific reports. Published details of Soviet space 'spectaculars' are included. Author

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

N75-25235*+ National Aeronautics and Space Administration, Washington, D.C.
REMOTE SENSING OF EARTH RESOURCES: A LITERATURE SURVEY WITH INDEXES (1970 - 1973 SUPPLEMENT). SECTION 1: ABSTRACTS
1975 654 p refs
(NASA-SP-7036(01)-Sect-1) Avail: NTIS HC $5.00 CSCL 08F

Abstracts of reports, articles, and other documents introduced into the NASA scientific and technical information system between March 1970 and December 1973 are presented in the following areas: agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, oceanography and marine resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis. Author

N75-25236*+ National Aeronautics and Space Administration, Washington, D.C.
REMOTE SENSING OF EARTH RESOURCES (1970 - 1973 SUPPLEMENT): A LITERATURE SURVEY WITH INDEXES. SECTION 2: INDEXES
Feb. 1975 402 p
(NASA-SP-7036(01)-Sect-2) Avail: NTIS HC $5.00 CSCL 08B

Documents related to the identification and evaluation by means of sensors in spacecraft and aircraft of vegetation, minerals, and other natural resources, and the techniques and potentialities of surveying and keeping up-to-date inventories of such riches are cited. These documents were announced in the NASA scientific and technical information system between March 1970 and December 1973. Author

N75-25237*# Eason Oil Co., Oklahoma City, Okla.
EVALUATION OF THE SUITABILITY OF SKYLAB DATA FOR THE PURPOSE OF PETROLEUM EXPLORATION Quarterly Report, Jan. - Mar. 1975
Robert J. Collins, Principal Investigator, Gerald Petzel, and John R. Everett (Earth Satellite Corp., Washington, D. C.) Mar. 1975 20 p refs EREP
(Contract NAS9-13297)
(E75-10257; NASA-CR-142632) Avail: NTIS HC $3.25 CSCL 08G

The author has identified the following significant results. Comparisons of the various photographic bands of Skylab imagery indicate that, overall, standard color (particularly S190B) is the most valuable for geological purposes. Detailed examination of all bands indicates that as with ERTS imagery each band contains useful information that is unique to it. The results of geological interpretations based on ERTS and Skylab imagery are strikingly similar. It appears that more information can be extracted from a single Skylab overpass than a single ERTS overpass, but that with repeated passes the lower resolution ERTS imagery may yield information comparable to that contained in S190B imagery. Comparison of Skylab photography to high altitude aircraft photography suggests that there are distinct advantages to using Skylab imagery for regional geologic interpretations. This is primarily because of the synoptic view provided by the space acquired imagery allows and encourages integration of regional geologic features.

N75-25238*# Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
AN INTERDISCIPLINARY STUDY OF THE ESTUARINE AND COASTAL OCEANOGRAPHY OF BLOCK ISLAND SOUND AND ADJACENT NEW YORK COASTAL WATERS Final Report, Jul. 1972 - Jan. 1974
Edward F. Yost, Principal Investigator, Rudolph Hollman, James Alexander, and Robert Nuzzi Apr. 1974 183 p refs Prepared in cooperation with New York Ocean Sci. Lab., Montauk Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21792)
(E75-10290; NASA-CR-142834; TR-20) Avail: NTIS HC $7.00 CSCL 08J

The author has identified the following significant results. Photo-optical additive color quantitative measurements were made of ERTS-1 reprocessed positives of New York Bight and Block Island Sound. Regression of these data on almost simultaneous ship sample data of water's physical, chemical, biological, and optical properties showed that ERTS bands 5 and 6 can be used to predict the absolute value of the total number of particles and bands 4 and 5 to predict the relative extinction coefficient in New York Bight. Water masses and mixing patterns in Block Island Sound heretofore considered transient were found to be persistent phenomena requiring revision of existing mathematical and hydraulic models.

N75-25239*# Rockwell International Science Center, Thousand Oaks, Calif.
IDENTIFICATION AND INTERPRETATION OF TECTONIC FEATURES FROM ERTS-1 IMAGERY: SOUTHWESTERN NORTH AMERICA AND THE RED SEA AREA Final Report, 30 May 1972 - 11 Feb. 1975
Monem Abdel-Gawad, Principal Investigator and Linda Tubbesing 5 May 1975 182 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21767)
(E75-10291; NASA-CR-142835; SC543.16FR) Avail: NTIS HC $7.00 CSCL 08G

The author has identified the following significant results. The ERTS-1 imagery was utilized to study major fault and tectonic lines and their intersections in southwestern North America. A system of transverse shear faults was recognized in the California Coast Ranges, the Sierra Nevada, the Great Basin, and Mexico. They are interpreted as expressions of a major left-lateral shear which predated the San Andreas system, the opening of the Gulf of California and Basin and Range rift development. Tectonic models for Basin and Range, Coast Ranges, and Texas-Parras shears were developed. Geological structures and Precambrian metamorphic trend lines of schistosity were studied across the Red Sea rift.

N75-25240*# Atmospheric Environment Service, Downsview (Ontario). Atmospheric Instruments Branch.
METEOROLOGICAL DATA COLLECTION VIA ERTS-A DATA RETRANSMISSION FACILITIES Final Report
R. E. Vockeroth, Principal Investigator and C. E. Robinson 30 Oct. 1974 26 p Sponsored by NASA ERTS
(E75-10293; NASA-CR-142837) Avail: NTIS HC $3.75 CSCL 04B

The author has identified the following significant results. Two meteorological data acquisition systems were built to support hydrometeorological programs related to flow forecasting. Data errors were detected in the stream level formation; these errors were caused by sensor difficulties.

N75-25241*# National Marine Fisheries Service, Bay Saint Louis, Miss.
APPLICATION OF REMOTE SENSING FOR FISHERY RESOURCE ASSESSMENT AND MONITORING Progress Report, 1 Apr. - 30 Apr. 1975
K. J. Savastano, Principal Investigator 30 Apr. 1975 3 p EREP
(NASA Order T-8217-B)
(E75-10294; NASA-CR-142838; PR-16) Avail: NTIS HC $3.25 CSCL 08A

There are no author-identified significant results in this report.

N75-25242*# Environmental Research Inst. of Michigan, Ann Arbor. Information Systems and Analysis.
DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Apr. 1975
Richard F. Nalepka and William A. Malila, Principal Investigators 21 May 1975 12 p EREP
(Contract NAS9-13280)
(E75-10295; NASA-CR-142839; ERIM-101900-55-L) Avail: NTIS HC $3.25 CSCL 09F

The author has identified the following significant results. An analysis of the conic data was completed for the spatial misregistration study. The effects of misregistration on classification and acreage estimation accuracy are being studied. Signatures were extracted for the primary ground covers in the test area.

N75-25243*# Michigan State Univ., East Lansing.
INVESTIGATION OF SKYLAB DATA Monthly Progress Report, Sep. 1974
Lester V. Manderscheid, Principal Investigators Sep. 1974 2 p EREP
(Contract NAS9-13332)
(E75-10296; NASA-CR-142840) Avail: NTIS HC $3.25 CSCL 12A

There are no author-identified significant results in this report.

N75-25244*# Michigan State Univ., East Lansing.
INVESTIGATION OF SKYLAB DATA Monthly Progress Report, Nov. 1974
Lester V. Manderscheid, Jon D. Erickson, Principal Investigators, and Richard F. Nalepka Nov. 1974 4 p Prepared in cooperation with Environmental Research Inst. of Michigan EREP
(Contract NAS9-13332)
(E75-10297; NASA-CR-142841; ERIM-104600-28-L) Avail: NTIS HC $3.25 CSCL 09D

There are no author-identified significant results in this report.

N75-25245*# South Dakota State Univ., Brookings. Remote Sensing Inst.
DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL Monthly Progress Report, Apr. 1975
Victor I. Myers, Principal Investigator 20 May 1975 2 p EREP
(Contract NAS9-13337)
(E75-10298; NASA-CR-142842) Avail: NTIS HC $3.25 CSCL 12A

There are no author-identified significant results in this report.

N75-25246*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES Monthly Progress Report, Apr. 1975
Roger M. Hoffer, Principal Investigator Apr. 1975 6 p EREP
(Contract NAS9-13380)
(E75-10299; NASA-CR-142843) Avail: NTIS HC $3.25 CSCL 09B

There are no author-identified significant results in this report.

N75-25247*# Michigan State Univ., East Lansing.
INVESTIGATION OF SKYLAB DATA Monthly Progress Report, Oct. 1974
Lester V. Manderscheid, Jon D. Erickson, Principal Investigators (Environ. Res. Inst. of Mich.), and Richard F. Nalepka (Environ. Res. Inst. of Mich.) Oct. 1974 4 p EREP
(Contract NAS9-13332)
(E75-10300; NASA-CR-142844; ERIM-104600-25-L) Avail: NTIS HC $3.25 CSCL 09D

There are no author-identified significant results in this report.

N75-25248*# Michigan State Univ., East Lansing.
INVESTIGATION OF SKYLAB DATA Monthly Progress Report, Jan. 1975
Lester V. Manderscheid, Jon D. Erickson, Principal Investigators, Richard F. Nalepka, and James P. Morgenstern Jan. 1975 5 p Prepared in cooperation with Environ. Res. Inst. of Mich. EREP
(Contract NAS9-13332)
(E75-10301; NASA-CR-142845; ERIM-104600-32-L) Avail: NTIS HC $3.25 CSCL 09D

There are no author-identified significant results in this report.

N75-25249*# Michigan State Univ., East Lansing.
INVESTIGATION OF SKYLAB DATA Monthly Progress Report, Dec. 1974
Lester V. Manderscheid, Jon D. Erickson, Principal Investigators, Richard F. Nalepka, and James P. Morgenstern Dec. 1974 6 p Prepared in cooperation with Environ. Res. Inst. of Mich. EREP
(Contract NAS9-13332)
(E75-10302; NASA-CR-142846; ERIM-104600-30-L) Avail: NTIS HC $3.25 CSCL 09D

There are no author-identified significant results in this report.

N75-25250*# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Progress Report, May 1975
George A. Maul, Principal Investigator May 1975 2 p EREP
(NASA Order T-4713-B)
(E75-10303; NASA-CR-142847) Avail: NTIS HC $3.25 CSCL 08C

There are no author-identified significant results in this report.

N75-25251*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Apr. 1975
Irvin J. Sattinger, Principal Investigator 13 May 1975 3 p EREP
(Contract NAS9-13283)
(E75-10304; NASA-CR-142848; ERIM-103300-50-L) Avail: NTIS HC $3.25 CSCL 08F

The author has identified the following significant results. A preliminary analysis of the Gratiot-Saginaw game area was conducted for the matrix probabilities of misclassification for both multispectral scanner signatures and the ERTS signatures. This analysis indicated that certain signatures of similar vegetation types had relatively high probabilities of misclassification and should logically be combined into a single signature for each major class. This would result in a single class of trees having a broad range of crown densities and two or three types of wetlands. It was clear that substantially different terrain classes could be reliably discriminated. It was also noted that areas of pine and regenerated aspen could be discriminated from other surface types.

N75-25252*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF RECREATIONAL LAND AND OPEN SPACE

USING SKYLAB IMAGERY Monthly Progress Report, Mar. 1975
Irvin J. Sattinger, Principal Investigator 14 Apr. 1975 3 p EREP
(Contract NAS9-13283)
(E75-10305; NASA-CR-142849; ERIM-103300-47-L) Avail: NTIS HC $3.25 CSCL 08F

The author has identified the following significant results. The data quality, production of photographic enlargements, and digital printout that displayed the Gratiot-Saginaw game area were assessed, using histogramming of each spectral channel. Results showed some dissimilarities in the ranges of data values for even and odd numbered SDO's in order to depict many of the major scene classes. Major cover types were identified and located on aerial photos and maps.

N75-25253*# Boeing Co., Kent, Wash.
ANALYSIS PROBLEMS OF MULTISPECTRAL SCANNER DATA Monthly Report, Apr. - May 1975
David L. Tingey, Principal Investigator May 1975 5 p EREP
(Contract NAS9-13303)
(E75-10306; NASA-CR-142850) Avail: NTIS HC $3.25 CSCL 09D

There are no author-identified significant results in this report.

N75-25254*# Kansas Univ. Center for Research, Inc., Lawrence. Atmospheric Science Lab.
MAPPING OF SNOW COVER AND FREEZE THAW LINE Progress Report, May 1975
Joe R. Eagleman and Ernest Pogge, Principal Investigators May 1975 4 p EREP
(Contract NAS9-13273)
(E75-10307; NASA-CR-142851; TR-239-22) Avail: NTIS HC $3.25 CSCL 08B

There are no author-identified significant results in this report.

N75-25255*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
APPLICATION OF LANDSAT TO THE SURVEILLANCE AND CONTROL OF LAKE EUTROPHICATION IN THE GREAT LAKES BASIN Progress Report, Mar. - May 1975
Robert H. Rogers, Principal Investigator Jun. 1975 41 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-20942)
(E75-10308; NASA-CR-142852; BSR-4183) Avail: NTIS HC $3.75 CSCL 08H

The author has identified the following significant results. Preliminary results in Saginaw Bay show that processed LANDSAT data provides a synoptic view of turbidity and circulation patterns that no degree of ground monitoring can provide. Processed imagery was produced to show nine discrete categories of turbidity, as indicated by nine Secchi depths between 0.3 and 3.3 meters. Analysis of lakes near Madison, Wisconsin show that inland lake water can be categorized by LANDSAT as clear, tannin, algal, and red clay. LANDSAT's capability to inventory watershed land use was throughly demonstrated in the Ohio-Kentucky-Indiana regional planning area. Computer tabulations providing area covered by each of 16 land use categories were rapidly and economically produced for each of the 225 watersheds and nine counties.

N75-25256*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES Monthly Progress Report, May 1975
Roger M. Hoffer, Principal Investigator May 1975 10 p EREP
(Contract NAS9-13380)
(E75-10309; NASA-CR-142910) Avail: NTIS HC $3.25 CSCL 08F

The author has identified the following significant results. MSS data on the area near Lake Hope and San Miguel on the Ophir and Mt. Wilson quadrangles were classified. Two vein-like areas of alteration were apparent, along with the hill wash composed primarily of altered rock. These areas were quite delineated. A small oval patch of shadowed alteration was classified in a location in which alteration was previously unnoticed during an airphoto study.

N75-25257*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
INVENTORY OF FOREST AND RANGELAND RESOURCES, INCLUDING FOREST STRESS Bimonthly Progress Report, 16 Mar. - 15 May 1975
Robert C. Aldrich, Frederick P. Weber, and Richard S. Driscoll, Principal Investigators 20 May 1975 6 p EREP
(NASA Order T-4106-B)
(E75-10310; NASA-CR-142853; BMPR-17) Avail: NTIS HC $3.25 CSCL 08F

There are no author-identified significant results in this report.

N75-25258*# Massachusetts Univ., Amherst. Dept. of Geology.
MAPPING AND ANALYSIS OF SAND DUNE FIELDS AND RELATED EOLIAN EROSIONAL FEATURES IN RELATIVELY INACCESSIBLE REGIONS Final Report
Donald O. Doehring, Principal Investigator Jun. 1975 19 p refs ERTS
(Contract NAS5-21871)
(E75-10311; NASA-CR-142854) Avail: NTIS HC $3.25 CSCL 08B

There are no author-identified significant results in this report.

N75-25259*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
SURFACE COMPOSITIONAL MAPPING BY SPECTRAL RATIOING OF ERTS-1 MSS DATA IN THE WIND RIVER BASIN AND RANGE, WYOMING Final Report, Sep. 1972 - Sep. 1974
Robert K. Vincent, Principal Investigator, B. C. Salmon, W. W. Pillars, and J. E. Harris Jun. 1975 72 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21783)
(E75-10312; NASA-CR-142855; ERIM-193300-32-F) Avail: NTIS HC $4.25 CSCL 08B

The author has identified the following significant results. ERTS data collected in August and October 1972 were processed on digital and special purpose analog recognition computers using ratio enhancement and pattern recognition. Ratios of band-averaged laboratory reflectances of some minerals and rock types known to be in the scene compared favorably with ratios derived from the data by ratio normalization procedures. A single ratio display and density slice of the visible channels of ERTS MSS data, Channel 5/Channel 4 (R5,4), separated the Triassic Chugwater formation (redbeds) from other formations present and may have enhanced iron oxide minerals present at the surface in abundance. Comparison of data sets collected over the same area at two different times of the year by digital processing indicated that spectral variation due to environmental factors was reduced by ratio processing.

N75-25260*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
THE EFFECTS OF SOIL MOISTURE AND PLANT MORPHOLOGY ON THE RADAR BACKSCATTER FROM VEGETATION
Fawwaz T. Ulaby, Thomas F. Bush, Percy P. Batlivala, and Josef Cihlar Jul. 1974 101 p refs
(Contract NAS9-10261)
(NASA-CR-141684; RSL-TR-177-51) Avail: NTIS HC $5.25 CSCL 17I

The results of experimental studies on the backscattering properties of corn, milo, soybeans and alfalfa are presented. The measurements were made during the summer of 1973 over the 8 to 18 GHz frequency band. The data indicate that soil moisture estimation is best accomplished at incidence angles near nadir with lower frequencies, while crop discrimination is best accomplished using two frequencies at incidence angles ranging from 30 deg to 65 deg. It is also shown that temporal plant morphology variations can cause extreme variations in the values of the scattering coefficients. These morphological changes can be caused by growth, heavy rain and in the case of alfalfa, harvesting. Author

N75-25261*# Stanford Univ., Calif. Computer Science Dept.
STANFORD AUTOMATIC PHOTOGRAMMETRY RESEARCH
Lynn H. Quam and Marsha Jo Hannah Dec. 1974 17 p refs
(Contract NAS1-9682; Contract DAHC-15-73-0435)
(NASA-CR-132661; SU-Memo-AIM-254;
SU-STAN-CS-74-472) Avail: NTIS HC $3.25 CSCL 08B

A feasibility study on the problem of computer automated aerial/orbital photogrammetry is documented. The techniques investigated were based on correlation matching of small areas in digitized pairs of stereo images taken from high altitude or planetary orbit, with the objective of deriving a 3-dimensional model for the surface of a planet. Author

N75-25262*# Kanner (Leo) Associates, Redwood City, Calif.
FUNDAMENTALS OF SATELLITE GEODESY
A. A. Izotov, V. I. Zubinsky, N. L. Makarenko, and A. M. Mikisha Washington NASA Jun. 1975 330 p refs Transl. into ENGLISH from the book "Osnovy Sputnikovoy Geodezii" Moscow, Nedra Press, 1974 p 1-317
(Contract NASw-2481)
(NASA-TT-F-16222) Avail: NTIS HC $9.50 CSCL 08E

The geometric and dynamic methods of satellite geodesy are presented along with problems of photographic astrometry, celestial mechanics, and higher geodesy upon which satellite geodesy is based. Methods and apparatus for observation of artificial earth satellites are given plus the principles and methods of processing of the results of observations. Author

N75-25263*# Ecosystems International, Inc., Gambrills, Md.
IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT, AND DEVELOPMENT OF WATER RESOURCES Final Report, Jun. 1974 - Jun. 1975
P. A. Castruccio, H. L. Loats, T. R. Fowler, and S. L. Frech May 1975 100 p refs
(Contract NAS5-20567)
(NASA-CR-143810; ECO-75:C-3) Avail: NTIS HC $4.75 CSCL 08H

Principal water resources users were surveyed to determine the impact of remote data streams on hydrologic computer models. Analysis of responses demonstrated that: most water resources effort suitable to remote sensing inputs is conducted through federal agencies or through federally stimulated research; and, most hydrologic models suitable to remote sensing data are federally developed. Computer usage by major water resources users was analyzed to determine the trends of usage and costs for the principal hydrologic users/models. The laws and empirical relationships governing the growth of the data processing loads were described and applied to project the future data loads. Data loads for ERTS CCT image processing were computed and projected through the 1985 era. Author

N75-25264*# International Business Machines Corp., Huntsville, Ala. Federal Systems Div.
A STUDY OF APPLICATION OF REMOTE SENSING TO RIVER FORECASTING. VOLUME 1: EXECUTIVE SUMMARY Final Report
Mar. 1975 23 p refs
(Contract NAS8-29880)
(NASA-CR-143858; IBM-75W-00056-Vol-1) Avail: NTIS HC $3.25 CSCL 08H

A project is described whose goal was to define, implement and evaluate a pilot demonstration test to show the practicability of applying remotely sensed data to operational river forecasting in gaged or previously ungaged watersheds. A secondary objective was to provide NASA with documentation describing the computer programs that comprise the streamflow forecasting simulation model used. A computer-based simulation model was adapted to a streamflow forecasting application and implemented in an IBM System/360 Model 44 computer, operating in a dedicated mode, with operator interactive control through a Model 2250 keyboard/graphic CRT terminal. The test site whose hydrologic behavior was simulated is a small basin (365 square kilometers) designated Town Creek near Geraldine, Alabama. Author

N75-25265*# International Business Machines Corp., Huntsville, Ala. Federal Systems Div.
A STUDY OF APPLICATION OF REMOTE SENSING TO RIVER FORECASTING. VOLUME 2: DETAILED TECHNICAL REPORT, NASA-IBM STREAMFLOW FORECAST MODEL USER'S GUIDE Final Report
Mar. 1975 411 p refs
(Contract NAS8-29880)
(NASA-CR-143859; IBM-75W-00056-Vol-2) Avail: NTIS HC $10.50 CSCL 08H

The Model is described along with data preparation, determining model parameters, initializing and optimizing parameters (calibration) selecting control options and interpreting results. Some background information is included, and appendices contain a dictionary of variables, a source program listing, and flow charts. The model was operated on an IBM System/360 Model 44, using a model 2250 keyboard/graphics terminal for interactive operation. The model can be set up and operated in a batch processing mode on any System/360 or 370 that has the memory capacity. The model requires 210K bytes of core storage, and the optimization program, OPSET (which was used previous to but not in this study), requires 240K bytes. The data band for one small watershed requires approximately 32 tracks of disk storage. Author

N75-25266*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
WALLOPS GEOS-C ALTIMETER PREPROCESSING REPORT
C. D. Leitao, C. L. Purdy, and R. L. Brooks (Wolf Res. and Develop. Corp., Pocomoke City, Md.) May 1975 121 p refs
(Contract NAS6-2173)
(NASA-TM-X-69357) Avail: NTIS HC $5.25 CSCL 05B

The procedures used to process the GEOS-C radar altimeter data from raw telemetry data to a final user data product are described along with the radar altimeter hardware design and operating parameters. Author

N75-25267*# Kanner (Leo) Associates, Redwood City, Calif.
THE TERTIARY AND QUATERNARY VOLCANOES OF THE WESTERN AND CENTRAL TIBESTI MOUNTAINS (THE SAHARA, CHAD)
Pierre M. Vincent Washington NASA Apr. 1975 350 p refs Transl. into ENGLISH from Bur. de Recherche Geol. et Minieres, Memoirs, no. 23, 1963 p 1-297
(Contract NASw-2481)
(NASA-TT-F-16299) Avail: NTIS HC $9.50 CSCL 08F

The results of a field study intended to deal with the geological aspects of the volcanism of the Saharan region, especially the rhyolitic volcanism, the richest and most complex form, are presented. The prevolcanic substratum was found to consist of Precambrian rock together with sandstone formations of probable Paleozoic or Lower Cretaceous origin. The uplifting of the massif was due to Hercynian movements. The volcanic rock was classified as ancient volcanism, predominantly consisting of basalts and rhyolites, and recent volcanism, which is primarily trachyandesitic. The latter represents only 2% of the total volume. These formations are discussed chronologically, with attention to individual structures and their comparison to similar formations found in other parts of the world. Interpretations of the origin of the volcanism are proposed, and petrochemical findings are given in detail. Author

N75-25268*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
THE CITARS EFFORT BY THE ENVIRONMENTAL RESEARCH INSTITUTE OF MICHIGAN Final Report, 15 May 1974 - 15 Feb. 1975
William A. Malila, Daniel P. Rice, and Richard C. Cicone Apr. 1975 129 p refs
(Contract NAS9-14123)
(NASA-CR-141851; ERIM-109600-12-F) Avail: NTIS

HC $5.75 CSCL 02C

The objectives of the research task for crop identification technology assessment for remote sensing are outlined. Data gathered by the Landsat 1 multispectral scanner over the U.S. Corn Belt during 1973 is described, and procedures for recognition processing of the data is discussed in detail. The major crops of prime interest were corn and soybeans; they were recognized with different levels of accuracy throughout the growing season, but particularly during late August. Wheat was the major crop of interest in early June. Author

N75-25269*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FEASIBILITY OF MOSSBAUER SURVEY METER FOR HYDROCARBON AND MINERAL RESERVES
Jag J. Singh 4 Jun. 1975 26 p refs
(NASA-TM-X-72703) Avail: NTIS HC $3.75 CSCL 08G

The feasibility of developing a Mossbauer survey meter for geophysical prospecting was investigated. Various critical requirements that will have to be met by the source and absorber crystals in such an instrument were identified. It was concluded that a survey meter based on (Rh-103 resonance (40 kev) yields Rh-103) isomeric transition is feasible and should be developed. Author

N75-25270*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
NINETEEN HUNDRED SEVENTY THREE SIGNIFICANT ACCOMPLISHMENTS
Nov. 1974 91 p refs
(NASA-TM-X-66863; JSC-09244) Avail: NTIS HC $4.75 CSCL 08B

Data collected by the Skylab remote sensing satellites was used to develop applications techniques and to combine automatic data classification with statistical clustering methods. Continuing research was concentrated in the correlation and registration of data products and in the definition of the atmospheric effects on remote sensing. The causes of errors encountered in the automated classification of agricultural data are identified. Other applications in forestry, geography, environmental geology, and land use are discussed. Author

N75-25271# Los Alamos Scientific Lab., N.Mex.
CHARACTERIZATION OF ROCK MELTS AND GLASSES FORMED BY EARTH-MELTING SUBTERRENES
L. B. Lundberg Jan. 1975 13 p refs
(Contract W-7405-eng-36)
(LA-5826-MS) Avail: NTIS HC $3.25

Data are presented on the molten and the solid rock-glass products formed by earth-melting Subterrenes. The melting behavior, thermal transport, viscosity, electrical resistivity, and solidification behavior of several molten rock-glasses are described. The visual appearance, gas and water permeabilities, thermal expansion, thermal conductivity, and crush strength of several solid rock-glasses are also documented. Author (NSA)

N75-25272# Oxford Univ. (England). Dept. of Agricultural Science.
THE COST EFFECTIVENESS OF TERRAIN EVALUATION. VOLUME 2: REVIEW OF FIELD WORK, 1971 - 1974 Final Technical Report
P. H. T. Beckett Mar. 1975 215 p
(Contract DAJA37-73-R-0029; DA Proj. 2M0-61102-B-52B)
(AD-A007280) Avail: NTIS CSCL 08/13

The aim of this project is to analyze the influence of all relevant choices between procedures for sampling, classifying, and mapping soils or soil properties, and for evaluating the soils information. The results are expected also to be applicable to maps, etc., of other terrain properties. GRA

N75-25273# Hebrew Univ., Jerusalem (Israel). Dept. of Geography.
THE GEOMORPHOLOGY AND CLIMATOLOGY OF ARID WATERSHEDS Final Report, May 1972 - Sep. 1974
Asher P. Shick, and David Sharon Sep. 1974 181 p
(Contract DAJA37-72-C-3874; DA Proj. 2M0-61102-B-53B)
(AD-A008456) Avail: NTIS CSCL 08/7

The report presents the first publication of the comprehensive collection and analysis of environmental data on the Nahal Yael Research Watershed located in the Negev just north of Elat, Israel. Factors treated are: Precipitation; streamflow; erosion; sedimentation; and the concomitant landforms and geomorphic changes in an extremely arid environment. The report also discusses: Desert rainfall, surface flow in extreme desert terrain, and quantitative measurements of erosion and sedimentation processes in such environments. GRA

N75-25274# Defense Mapping Agency, Washington, D.C.
DEPARTMENT OF DEFENSE NATIONAL GEODETIC SATELLITE PROGRAM Final Report
Feb. 1975 234 p refs
(AD-A008562; DMA/TR-75-001) Avail: NTIS CSCL 08/5

A history of the use of satellites in geodesy within the Department of Defense is presented. A section on instrumentation describes the BC-4 and PC-1000 cameras, SECOR, laser, and Doppler satellite tracking equipment as well as the satellite flashing light system. The data used in several different solutions, the corrections applied and the preprocessing methods are described. In addition, the theory for satellite triangulation, trilateration, short arc and Doppler methods and the least squares collocation method for combining satellite derived and surface gravity data are discussed. Geodetic results are tabulated which include the coordinates of various tracking stations, the gravitational potential and the geoid. Other results discussed include evaluations of Love's number, solar radiation pressure, atmospheric drag variations, earth's rotational rate, pole positions and crustal motion. GRA

N75-25275# Washington Univ., St. Louis, Mo.
AIRPHOTO INTERPRETATION OF THE FORM AND BEHAVIOR OF ALLUVIAL RIVERS Final Report, 1 Jul. 1970 - 31 Dec. 1974
James C. Brice 25 Jan. 1975 12 p refs
(Grant DA-ARO(D)-31-124-70-G89)
(AD-A008108; ARO-8623-4-EN) Avail: NTIS CSCL 08/2

A scheme for the classification of alluvial rivers, according to form properties observable on vertical black and white airphotos, is presented. The scheme was developed by analysis of about 250 river reaches, which occur in climatic conditions ranging from arctic to equatorial and which probably represent the full range of types. Most reaches are in the U.S. where, in addition to sequential aerial photography, large-scale maps and gaging station records were obtained for 200 reaches. Use was made of maps and ERTS imagery for foreign rivers. According to the scheme, a river reach is classified additively according to its degree and character of sinuosity, braiding, and anabranching. A total of 3120 river types can be distinguished and designated by numbers and letters, such that no designation is longer than 6 spaces. Aspects of river behavior that have been reported on during the investigation include the evolution and classification of meander loops, rates of lateral migration for specific rivers, and the size-frequency distribution and succession of meander loops. GRA

N75-25276# National Military Command System Support Center, Washington, D.C.
TERRA PLOT SYSTEM: USER'S MANUAL Final Report
Paul M. Colman 7 Jan. 1975 397 p refs
(AD-A008323; NMCSSC-CSM-UM-161-75) Avail: NTIS CSCL 08/2

The Terra Plot System (TPLOT) is a set of computer programs that provides the user with the ability to solve geographic illustration problems. A host computer system (either the IBM-360 or the HIS-6080) and an electronically driven pen and ink plotting system (the CalComp 780/718) are the hardware necessary to use these programs. GRA

N75-25277# Coastal Engineering Research Center, Fort Belvoir, Va.
A PRIMER OF BASIC CONCEPTS OF LAKESHORE PROCESSES
David B. Duane, D. Lee Harris, Richard O. Bruno, and Edward B. Hands Jan. 1975 32 p refs
(AD-A008010; CERC-MP-1-75) Avail: NTIS CSCL 13/2

Water waves and currents vary among other things, with geography, water level (stage of tide), season, and offshore slope.

The net effect of wave and current forces impinging upon a shoreline, ocean or lake is to change the morphology of the coastline as a result of erosion, transport, and deposition of sediment. In general, the model of sediment transport can be thought of as movement of a sand grain from some source such as a headland, to a barrier beach, to a dune, into an inlet or to an offshore sink. Knowledge of the processes of erosion, transportation, and deposition of sediment implicit in this model is of value to the engineer and the geologist as well as the shoreline property owner. Concepts of generation of water motions and directions of flow, characteristics of the flow, water levels and their periodicity, bed form generation and movement, and sediment entrainment and transport are fundamental to the understanding of lakeshore processes. Basic aspects of these concepts, in lay terms, are presented in the report. GRA

N75-25278# Northrop Corp., Hawthorne, Calif.
STEREOSCOPIC TERRAIN DISPLAY FOR MEASUREMENT APPLICATIONS Final Report
J. T. McCrickered and G. H. Glaser 13 Dec. 1974 150 p refs
(Contract DAAK02-74-C-0051; DA Proj. 4A1-61102-B-52C)
(AD-A008085; NRTC-74-60R; ETL-0002) Avail: NTIS CSCL 08/2

A stereoscopic terrain display is developed which looks realistic because visual parameters are closely matched to those encountered in natural environments. Wide-view rear projection is achieved without need for spectacles or eyepieces; the light beams from left- and right-viewpoint pictures are individually directed into the respective eyes of the user. Terrain can be continuously scanned across the display screen without interruption of stereoscopic effect. Pictures are loaded into the display unit as slides. Parallax normal to the eye-base direction (i.e., y-parallax) is zeroed at once across the entire display area without user effort, by rectifying the pictures in production. Good resolution is achieved by rectifying the pictures with perfectly focused lenses. Also treated are methods to make precise measurements of terrain features in the display. Errors anticipated in a well designed measurement system are estimated. Most convenient measurement scheme may use holographic picture-slides. A display unit was demonstrated with a holographic picture-slide. GRA

N75-25279# Cheney, Miller, Ellis and Associates, Inc., Putnam, Conn.
NONSTRUCTURAL MEASURES FOR FLOOD PLAIN AND FLOOD DAMAGE MANAGEMENT, WITH APPLICATION TO THE CONNECTICUT RIVER BASIN SUPPLEMENTAL FLOOD MANAGEMENT Final Report
Philip B. Cheney Feb. 1974 209 p refs
(PB-238498) Avail: NTIS HC $7.25 CSCL 08H

Nonstructural flood management techniques in use in the Connecticut River Basin and elsewhere are described in detail and their advantages and limitations are discussed, along with the effectiveness of nonstructural flood management at the state level in the basin. A framework is presented for applying information on nonstructural measures to actual flood plain situations in the basin, and selected examples of nonstructural flood management at the community level are discussed. Information on basin flood plains and communities is presented for use in selecting possible combinations of technically feasible flood management programs and in evaluating their potential effectiveness in controlling flood losses in the basin. GRA

N75-25280# Soil Conservation Service, Durham, N.H.
THE RIVER'S REACH: AN ASSESSMENT OF EXISTING FLOOD PROTECTION IN UPSTREAM WATERSHEDS OF THE CONNECTICUT RIVER BASIN Final Report
Mar. 1974 100 p
(PB-238499/8) Avail: NTIS HC $4.75 CSCL 08H

The Soil Conservation Service evaluated existing flood management systems in three small tributary watersheds of the Connecticut River-Whetstone Brook and the Passumpsic River in Vermont, and the Mill River in Massachusetts. Average annual damages are estimated from synthetic floods ranging in frequency from five to 100 years and from historical floods. The nature and extent of development in flood hazard areas is described, and both structural and nonstructural measures to reduce damages are identified and evaluated. Significant flood problems requiring structural and/or nonstructural solutions are identified in each watershed. Local views were solicited and are summarized. GRA

N75-25281# National Oceanic and Atmospheric Administration, Rockville, Md.
INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES, IFYGL BULLETIN NO. 12
Oct. 1974 70 p refs
(COM-75-10303/6; IFYGL-Bull-12; NOAA-75013003) Avail: NTIS HC $4.25 CSCL 08H

Canadian project reports are listed along with the name of the principal investigators and a report of the progress of each report. Abstracts of International Field Year for the Great Lakes, papers are included for completed projects. Additional Canadian IFYG scientific papers not previously listed in IFYGL bulletins are listed. The issue covers the progress of IFYGL tasks for April 1 through June 30, 1974, and tables set forth the summary of data for final IFYGL archive. GRA

N75-25282# National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program.
RECONNAISSANCE OF BOTTOM SEDIMENTS ON THE INNER AND CENTRAL NEW JERSEY SHELF (MESA DATA REPORT)
William L. Stubblefield, Michael Dicken, and Donald J. P. Swift Jul. 1974 43 p refs
(COM-75-10285/5; MESA-74-1; NOAA-74111811) Avail: NTIS HC $3.75; SOD HC as 163.10:99/INT-1 CSCL 08G

The petrography of samples from two areas on the New Jersey Shelf was analyzed to resolve the relation between surficial grain-size distribution, hydraulic regime and bathymetry in order to understand the sediment flux in these areas. The collected samples were examined for grain-size distribution in quarter-phi intervals and for related statistical parameters. A mean grain-size distribution map suggests a relation between bathymetry and grain-size distribution which in turn, defines certain features of a hydraulic regime. Selected samples were further examined for relative percent of detritus, clay pebbles, fauna content, and heavy mineral concentrations. The individual petrographical parameters are presented in tabular form. GRA

N75-25283# Bureau of Mines, Laramie, Wyo. Energy Research Center.
PULSED NUCLEAR MAGNETIC RESONANCE STUDIES OF OIL SHALES--ESTIMATION OF POTENTIAL OIL YIELDS Report of Investigations, 1974
F. P. Miknis, A. W. Decora, and G. L. Cook Nov. 1974 53 p refs
(PB-240023/2; BM-RI-7984) Avail: NTIS HC $4.25 CSCL 07D

It is shown that broad-line nuclear magnetic resonance (NMR) techniques have potential applications for rapid evaluation of oil-shale deposits. The basis for the pulsed NMR oil-shale assay method lies in the assumption that the free induction decay (FID) amplitude following a 90 degree pulse is proportional to the potential oil yield. This assumption was tested on two groups of oil-shale samples, numbering 141 and 263 samples, from two different oil-shale cores. For both groups of samples a small number were selected as calibration samples. Free induction decay amplitude measurements were made. GRA

N75-25284# Missouri Univ., Rolla. Dept. of Mechanical and Aerospace Engineering.
DIURNAL TEMPERATURE DISTRIBUTION IN SMALL RESERVOIR Final Report
B. F. Armaly 17 Jan. 1975 58 p refs
(Contract DI-14-31-0001-4025)
(PB-239402/1; OWRT-A-080-MO(1); W75-04443) Avail: NTIS HC $4.25 CSCL 13B

The diurnal temperature distribution in a deep water impoundment which is exposed to heating and cooling loads by convection, evaporation, and radiation is examined. The diurnal behavior of the solar load, directional and spectral, is used with the selective attenuation and reflection characteristics of the water to account for the internal solar energy absorption rate. Simple atmospheric and water attenuation models were used to examine and simulate the diurnal behavior. The results demonstrate the stratification developments of the reservoir and indicate that in some cases deep layer responds continuously to the diurnal fluctuations of surface energy loads. GRA

N75-25285# Mississippi-Alabama Sea Grant Consortium, Ocean Springs, Miss.
PROCEEDINGS FROM THE ALABAMA GOVERNOR'S CONFERENCE ON COASTAL ZONE MANAGEMENT
1974 157 p Conference held at Gulf Shores, Ala., 22-23 Oct. 1974 Sponsored by NOAA
(COM-75-10312/7; MASGP-74-042; NOAA-75013004) Avail: NTIS HC $6.25 CSCL 13B

The program for this conference was designed to address coastal zone management from the federal, state, regional and local viewpoints, using a series of keynote addresses. Also, areas of particular concern within the coastal zone were discussed by a panel of experts from seven different fields. These were concerned with the following: (1) population growth and residential development; (2) transportation and navigation; (3) commerce and industry; (4) pollution abatement; (5) recreation and tourism; (6) fisheries; and (7) mineral resources. GRA

N75-25286# Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
THERMAL CONDUCTIVITY OF A FROZEN HUBBARD LOAMY SAND M.S. Thesis
John Edward Gilley, Jr. Jul. 1974 91 p refs
(Contract DI-14-31-0001-3602)
(PB-240025/7; W75-05442; OWRT-B-057-MINN(3)) Avail: NTIS HC $4.75 CSCL 08M

The heat transfer characteristics of a naturally occurring field soil were examined. A transient-state, cylindrically thermal probe was built. Tests were conducted on a fine Ottawa sand under both dry and saturated conditions to compare the probe response to results reported previously. Thermal conductivities of a naturally occurring, frozen, Hubbard loamy sand were determined at five soil moisture contents at temperatures of -15.5 and -2.5 C. Results show a range in measured conductivity values from a low of .437 watts/mC at a moisture content of .82% by weight to a high of 1.74 watts/mC at 16.6% moisture content. GRA

N75-25287# Missouri Univ., Rolla. Dept. of Chemistry.
USE OF A MICROWAVE REMOTE SENSOR FOR DETERMINATION OF WATER IN SUBSOILS
Byong Ki Park, James E. Adair, and C. McDowell Aug. 1974 46 p refs
(Contract DI-14-31-0001-4025)
(PB-239255/3; W75-04149; OWRT-A-070-MO(1)) Avail: NTIS HC $3.75 CSCL 08M

Laboratory equipment using a microwave remote sensor was developed for measuring the amount of moisture in different soil materials. A technique based on the measurement of the microwave transmission properties of samples located within a waveguide was used, and the frequency used was 10.525 GHz. Input impedance was measured by slotted line techniques. Calculations of the complex dielectric constant were made for each measured value of the complex propagation constant to provide a comparison with measured values of various soils. Evaluations were made for the use of passive and active microwave remote sensing devices for water content of soils under different conditions. GRA

N75-25288# Bureau of Mines, Pittsburgh, Pa. Eastern Field Operation Center.
THE MINE MAP REPOSITORY: A SOURCE OF MINE MAP DATA Information Circular
Curtis D. Edgerton Nov. 1974 13 p refs
(PB-240136/2; BM-IC-8657) Avail: NTIS HC $3.25 CSCL 08I

The Pittsburgh Mine Map Repository of the Bureau of Mines, U.S. Department of the Interior, serves as a basic reference file, and for the archival preservation of mine map data of mines east of the Mississippi River. About 22,000 of an estimated 500,000 available mine maps have been microfilmed. A computerized index serves as the mechanism for retrieval of any microfilmed mine map. The operation, equipment, and index are described in the report. GRA

N75-25289# Environmental Research and Technology, Inc., Lexington, Mass.
SNOW MAPPING APPLICATIONS OF THERMAL INFRARED DATA FROM THE NOAA SATELLITE VERY HIGH RESOLUTION RADIOMETER (VHRR) Final Report
James C. Barnes, Clinton J. Bowley, and James L. Cogan Nov. 1974 80 p refs
(Grant NOAA-3-35385)
(COM-75-10273/1; ERT-0438-F; NOAA-75021202) Avail: NTIS HC $4.75 CSCL 04B

The application of the NOAA satellite VHRR (Very High Resolution Radiometer) thermal infrared data for mapping snow cover was investigated. A sample of VHRR data from the 1973 to 1974 winter and spring seasons is analyzed for mountainous terrain areas in the western United States and for relatively flatter areas in the Midwest Southeast, and Northeast. The thermal patterns displayed in the infrared data are compared with snow cover patterns mapped from corresponding VHRR visible imagery, ERTS-1 imagery, and reported snow amounts. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N75-25290*# Sperry Rand Corp., Great Neck, N.Y.
GENERAL ELECTRIC 20-AMPERE HOUR NICKEL-CADMIUM BATTERY Interim Test Report
W. W. Kirsch 30 May 1974 22 p
(NAS8-21812)
(NASA-CR-120748; Rept-40M22410) Avail: NTIS HC $3.25 CSCL 10C

The interaction, effect, and controllability of the performance parameters of the General Electric 20-ampere-hour, 24-cell nickel cadmium battery are investigated. The battery was cycled under simulated orbit conditions. The acquired data was analyzed and evaluated in terms of battery parameters and performance characteristics. Conclusions and tests results are presented along with recommendations for further study. J.M.S.

N75-25291*# Sperry Rand Corp., Huntsville, Ala. Space Power Sources Section.
NICKEL-CADIUM BATTERIES FOR APOLLO TELESCOPE MOUNT
W. W. Kirsch and A. E. Shikoh 30 May 1974 84 p
(Contract NAS8-20055)
(NASA-CR-120747; Rept-40M22411) Avail: NTIS HC $4.75 CSCL 10C

The operational testing and evaluation program is presented which was conducted on 20-ampere-hour nickel-cadmium (Ni-Cd) batteries for use on the Apollo telescope mount (ATM). The test program was initiated in 1967 to determine if the batteries could meet ATM mission requirements and to determine operating characteristics and methods. The ATM system power and charging power for the Ni-Cd secondary batteries is provided by a solar array during the 58-minute daylight portion of the orbit; during the 36-minute night portion of the orbit, the Ni-Cd secondary batteries will supply ATM system power. The test results reflect battery operating characteristics and parameters relative to simulated ATM orbital test conditions. Maximum voltage, charge requirements, capacity, temperature, and cyclic characteristics are presented. Author

N75-25292*# Houston Univ., Tex.
ENERGY RECOVERY FROM SOLID WASTE. VOLUME 2:

TECHNICAL REPORT Final Report, 1974
C. J. Huang and Charles Dalton Washington NASA Apr. 1975 245 p refs
(Grant NGT-44-005-114)
(NASA-CR-2526; S-443-Vol-2) Avail: NTIS HC $7.50 CSCL 10A

A systems analysis of energy recovery from solid waste demonstrates the feasibility of several current processes for converting solid waste to an energy form. The social, legal, environmental, and political factors are considered in depth with recommendations made in regard to new legislation and policy. Biodegradation and thermal decomposition are the two areas of disposal that are considered with emphasis on thermal decomposition. A technical and economic evaluation of a number of available and developing energy-recovery processes is given. Based on present technical capabilities, use of prepared solid waste as a fuel supplemental to coal seems to be the most economic process by which to recover energy from solid waste. Markets are considered in detail with suggestions given for improving market conditions and for developing market stability. A decision procedure is given to aid a community in deciding on its options in dealing with solid waste, and a new pyrolysis process is suggested. An application of the methods of this study are applied to Houston, Texas. Author

N75-25293# Electrotechnical Lab., Tokyo (Japan).
STUDIES ON IMPROVEMENT OF THE CHARACTERISTICS OF MHD POWER GENERATING CHANNEL
Takenobu Kajikawa Dec. 1974 106 p refs In JAPANESE; ENGLISH summary
(Rept-749) Avail: NTIS HC $5.25

Magnetohydrodynamic power generation expected to contribute to the conservation of energy resources and the protection of the environment is experimentally studied. The physical properties of the conducting fluid in the MHD power generating channel are identified along with its electrical properties. A small scale MHD power generation facility is used in experimental studies on the following aspects of magnetohydrodynamic power generation: (1) thermodynamic characteristics; (2) nonuniformity effects in the generating channel cross-section; (3) effects of the thermal boundary layer in front of the electrodes on the power generation; and (4) control of boundary layer by means of plasma injection and protrusion electrodes. Results are presented and discussed. J.M.S.

N75-25294# Committee on Finance (U. S. Senate).
WORLD OIL DEVELOPMENTS AND US OIL IMPORT POLICIES
Washington GPO 1973 158 p refs Rept. presented by the US Tariff Commission to the Comm. on Finance, 93d Congr., 1st Sess., 12 Dec. 1973 Prepared by Tariff Commission
(GPO-22-893) Avail: SOD HC $1.35

This report responds to a request by the Senate Committee on Finance, dated March 16, 1970, that the Tariff Commission give a full description of all considerations which should be weighed in reaching a decision on the question of substituting tariffs for quotas to control oil imports. The committee suggested that the commission consider costs of production in major exporting countries, tanker rates, most-favored-nation obligations of the United States, and the effect on U.S. revenues and the U.S. consumer of various tax and royalty adjustments by petroleum exporting countries. Author

N75-25295# Joint Publications Research Service, Arlington, Va.
PROPULSION UNITS FOR HIGH SPEED SHIPS
M. A. Mavlyudov, A. A. Rusetskiy, Yu. M. Sadovnikov, and E. A. Fisher 3 Jun. 1975 246 p refs Transl. into ENGLISH of the book "Dvizhiteli Bystrokhodnykh Sudov" Leningrad, Izdatelstvo Sudostroyeniye, 1973 p 1-239
(JPRS-64897) Avail: NTIS HC $7.50

Methods of designing propulsion systems for ships with hydrodynamic and aerodynamic support principles are examined along with the characteristic features of propulsion systems for high-speed ships and the problems of their structural composition. Emphasis is placed on the following propulsion systems: cavitating propellers; propulsion systems with angular power transmission; water-jet propulsion systems; and gas-water and air propulsion systems. J.M.S

N75-25296*# United Aircraft Corp., East Hartford, Conn.
STUDY OF FUEL CELL POWERPLANT WITH HEAT RECOVERY Final Report, 15 Aug. 1974 - 15 Feb. 1975
J. M. King, A. P. Grasso, and J. V. Clausi 24 Apr. 1975 112 p refs
(Contract NAS9-14220)
(NASA-CR-141854; FCR-0021) Avail: NTIS HC $5.25 CSCL 10C

It was shown that heat can be recovered from fuel cell power plants by replacing the air-cooled heat exchangers in present designs with units which transfer the heat to the integrated utility system. Energy availability for a 40-kW power plant was studied and showed that the total usable energy at rated power represents 84 percent of the fuel lower heating value. The effects of design variables on heat availability proved to be small. Design requirements were established for the heat recovery heat exchangers, including measurement of the characteristics of two candidate fuel cell coolants after exposure to fuel cell operating conditions. A heat exchanger test program was defined to assess fouling and other characteristics of fuel cell heat exchangers needed to confirm heat exchanger designs for heat recovery. Author

N75-25297# Stanford Research Inst., Menlo Park, Calif.
MEETING CALIFORNIA'S ENERGY REQUIREMENTS, 1975 - 2000
May 1973 422 p
(SRI Proj. ECC-2355)
Avail: NTIS HC $10.50

The energy outlook in the state of California was investigated within the perspective of the national and world outlook and with emphasis on the electric power sector of the state. The following factors were assessed: (1) California's economic framework and related demand for energy; (2) various means for altering the projected demand pattern, requirements for implementing each of these means, and appraisal of their significance; (3) California's future supply from each source of energy, as well as analysis of factors affecting availability and use; and (4) probable future trends in price. Conclusions are presented. Author

N75-25298*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHALLENGE TO AVIATION: HATCHING A LEANER PTEROSAUER
Frank E. Moss 1975 9 p Presented at Aeron. Propulsion Conf., Cleveland, 13 May 1975
(NASA-TM-X-71744) Avail: NTIS HC $3.25 CSCL 10B

Modifications in commercial aircraft design, particularly the development of lighter aircraft, are discussed as effective means of reducing aviation fuel consumption. The modifications outlined include: (1) use of the supercritical wing; (2) generation of the winglet; (3) production and flight testing of composite materials; and, (4) implementation of fly-by-wire control systems. Attention is also given to engineering laminar air flow control, improving cargo payloads, and adapting hydrogen fuels for aircraft use. L.B.

N75-25299# Committee on Science and Astronautics (U. S. House).
SOLAR ENERGY RESEARCH, DEVELOPMENT, AND DEMONSTRATION ACT OF 1974
Washington GPO 1974 385 p refs Hearings on H.R. 15612 before Subcomm. on Energy of Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., No. 42, 30 Jul. and 2 Aug. 1974
(GPO-39-827) Avail: Subcomm. on Energy

The hearings concerning research and development for solar energy are presented. The major research programs covered are: (1) solar heating and cooling of housing, commercial, and public buildings; (2) direct solar heat as a source for industrial processes; (3) thermal energy conversion; (4) the conversion of cellulose and other organic materials to useful energy or fuels; (5) photovoltaic and other direct conversion processes; (6) sea thermal power conversion; and (7) windpower conversion. The planning and implementation of the programs are discussed. J.R.T.

N75-25300# Committee on Science and Astronautics (U. S. House).

ENERGY POLICY AND RESOURCE MANAGEMENT

Bert Cooper, Theodor Galdi, Susan Drake, David Hack, James Mielke, Warren Donnelly, David Lindahl, Susan Abbasi, John Jimison, Wendy Grffin, ed. et al Washington GPO Jul. 1974 101 p refs Presented by Library of Congr. to Subcomm. on Energy of Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., Jul. 1974 Prepared by the Library of Congr., Sci. Policy Res. Div.
(GPO-33-634) Avail: Subcomm. on Energy

A collection of papers is presented on the topic of energy policy and resource management. Topics discussed include energy research and development policy, project independence, the licensing of nuclear power plants, enriched uranium supplies for nuclear power plants, federal tax treatment of oil and gas, regulation of natural gas products, energy shortage and the petrochemicals, rail freight discrimination against recyclable materials, the energy problem and national defense, and foreign policy implications of the energy shortage. M.J.S.

N75-25301# Committee on Science and Astronautics (U. S. House).

ENERGY LEGISLATION

Washington GPO May 1974 25 p refs Rept. of the Subcomm. on Energy of the Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., May 1974
(GPO-33-571) Avail: Sucomm. on Energy

Legislative activities on energy-related issues are summarized. Legislation in the areas of energy organization and regulation, environmental energy legislation, energy resources, energy research and development, energy conservation, and urban and rail transportation is described. M.J.S.

N75-25302# Westinghouse Astronuclear Lab., Pittsburgh, Pa.

PRIVY ROOF MOUNTED SHIELD PROPOSAL

17 Dec. 1964 44 p refs Sponsored by ERDA
(WANL-TME-1063) Avail: NTIS HC $3.75

The proposed shield represents a straight forward design which gives maximum flexibility in test car plumbing design. It also prevents the problems relative to hydrogen gas accumulation since this is impossible, and fires previously experienced, will not affect the water-cooled aluminum shield. In addition, design problems relative to component shielding will be eliminated. The extension of the privy roof shadow shield in the close proximity of the reactor will reduce by approximately 90 percent the radiation emitted by the reactor in the 135 deg sector that is shielded. This will appreciably reduce the test cell wall activation as well as other parts of the facility. The proposed shield on the NRX-A3, considering only 20 minutes of full power run time, would reduce facility activation considerably. Without this shadow shield activation of the test cell facility could become a major problem with long full power tests and certain critical components (activator seals, hydraulic fluid, electronic cables) could be damaged by the radiation levels. Author (NSA)

N75-25303# Bureau of Radiological Health, Rockville, Md.

THE 6TH ANNUAL NATIONAL CONFERENCE ON RADIATION CONTROL: NEW CHALLENGES

Oct. 1974 312 p refs Conf. held at San Antonio, Tex., 28 Apr. - 2 May 1974; sponsored by EPA, AEC and HEW
(DHEW/FDA-75-8010) Avail: NTIS

The challenge of integrating environmental, energy, and economic goals in the United States and worldwide is discussed. It is pointed out that the earth's energy budget is composed of inputs from solar radiation, tidal energy, and the energy from nuvlear, thermal, and gravitational sources, with more than 99% of this input solar radiation, of which less than 0.05% is converted by photosynthesis to energy storage in plants. During the past 100 years economic growth has depended on energy inputs from fossil fuels. During 1970 the total energy used in the United States was the equivalent of 2.7 billion tons of coal, with 95.9% provided by fossil fuels, 3.8% provided by falling water, and 0.3% by the fission of U-235. By the year 2000 it is predicted that the annual U.S. demand for energy in all forms will double this amount. NSA

N75-25304# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

AN INTERDISCIPLINARY ENGINEERING APPROACH TO A FACILITY DESIGN STUDY WITH EMPHASIS ON ENERGY CONSERVATION. VOLUME 1: EXECUTIVE SUMMARY Facility Systems Integration Design Study.

Robert J. Garlow, John F. Gilg, Charles A. Jackson, Jay N. Magill, and Robert S. Najaka Nov. 1974 33 p
(AD-A006803; GCE/MC/74-1-Vol-1) Avail: NTIS CSCL 15/5

An interdisciplinary engineering design study is made for a depot maintenance facility. The initial costs, performance, and energy and operating costs of various structural, electrical, and mechanical systems were investigated with the goal of attaining maximum conservation of energy. Where applicable, the impact of each of these subsystems on energy and operating costs for the integrated facility is evaluated to obtain data on which to base the final equipment and system selections. The following systems have been selected for the project facility to provide optimum energy conservation: (1) Spot cooling using an evaporative process for industrial applications, (2) a variable-volume air conditioning system for remaining building cooling requirements, (3) a cooling tower to supply process cooling water at 85F, and (4) a heat recovery system to reclaim excess heat energy. GRA

N75-25305# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

AN INTERDISCIPLINARY ENGINEERING APPROACH TO A FACILITY DESIGN STUDY WITH EMPHASIS ON ENERGY CONSERVATION. VOLUME 3: APPENDICES Facility Systems Integration Design Study.

Robert J. Garlow, John F. Gilg, Charles A. Jackson, Jay N. Magill, and Robert S. Najaka Nov. 1974 283 p
(AD-A006805; GCE/MC/74-1-Vol-3-App) Avail: NTIS CSCL 15/5

The volume contains calculations of costs, performance, and energy and operating costs of structural, electrical, and mechanical systems. GRA

N75-25306# Hittman Associates, Inc., Columbia, Md.

ENVIRONMENTAL IMPACTS, EFFICIENCY, AND COST OF ENERGY SUPPLY AND END USE, VOLUME 2 Final Report

Jan. 1975 271 p refs Sponsored in part by NSF and EPA
(Contract EQC-308)
(PB-239159; HIT-593-Vol-2) Avail: NTIS HC $8.50

The environmental impacts, efficiency, and costs associated with supply and end use of fossil fuels are determined. The output is this 2-volume report, which presents tabular, footnoted, and referenced data quantifying the energy related environmental impacts on land, water, air, solid waste, and occupational health. Characterized are six technologies with respect to their environmental impacts, efficiency, and cost: both low- and high-Btu gasification of coal, oil shale, fluidized bed boiler combustion, solvent refined coal, and coal liquefaction. Author

N75-25307# Army Foreign Science and Technology Center, Charlottesville, Va.

INVESTIGATION OF CHARACTERISTICS OF MAGNETOHYDRODYNAMIC GENERATORS IN INDUSTRIAL POWER PLANTS

L. S. Popyrin, N. N. Pshenichnov, A. P. Rogachev, A. G. Sokolskii, and L. K. Khokhlov 27 Oct. 1974 36 p refs Transl. into ENGLISH from Ref. Zh., Fiz. (USSR), no. 12, 1972 p 288-307
(AD-A008343; FSTC-HT-23-0121-75) Avail: NTIS CSCL 10/2

The authors studied a magnetohydrodynamic generator of the Faraday type with segmented electrodes in order to determine the main characteristics of the generator, including characteristics relevant to engineering-economic indices. The different variants were calculated using a mathematical model developed at the Power Institute of the Siberian Branch of the U.S.S.R. Academy of Sciences which was programmed for the Besm-4 electronic digital computer. GRA

N75-25308# Energy Research Corp., Bethel, Conn.

METAL HYDRIDE-AIR BATTERY Final Report, Jun. 1972 - Dec. 1974

Michael Onischak and Bernard S. Baker Mar. 1975 55 p refs
(Contract DAAB07-72-C-0317)
(AD-A008046; ECOM-72-0317-F) Avail: NTIS CSCL 10/2

Portable metal-hydride fueled fuel cell systems, producing regulated 28VDC output at 30 watts and 60 watts, have been built. The systems are easily refuelable with pellets of solid sodium aluminum hydride and water to generate hydrogen. Ambient air, supplied by natural convection, is the oxidant. The energy density approaches 960 watt-hours per pound of fuel. A power conditioning unit provides the regulated output power and logic circuits for automatic operation of the fuel cell systems. GRA

N75-25309# EIC, Inc., Newton, Mass.
SULPHUR-BASED LITHIUM-ORGANIC ELECTROLYTE SECONDARY BATTERIES Quarterly Report, 4 Sep. - 3 Dec. 1974
Gerhard L. Holleck and Fred S. Shuker Mar. 1975 41 p refs
(Contract DAAB07-74-C-0072)
(AD-A008044; C-405; ECOM-74-0072-4; QR-4) Avail: NTIS CSCL 10/3

This program is aimed at developing a rechargeable organic-electrolyte lithium battery to operate over the range -40 to +160F, have an energy density approaching 100 Whr/lb, a cycle life in excess of 500, and high charge retention. The approach is to use positive electrodes based on higher sulfides of Nb, Ti and V. Nb and Ti disulfides and trisulfides were prepared thermally. They were characterized by scanning electron microscopy and by X-ray diffraction. Charge-discharge cycles in PC/LiAlCl4 electrolytes are characterized by good reversibility and relatively flat voltage plateaus with mid-discharge potentials of 2.0 V. The discharge mechanism involves a change in the valence of the transition metal. The overall structure of the sulfides influences reversibility strongly during continued cycling. Structure depends on preparation procedures. Molybdenum disulfide is also electrochemically active. GRA

N75-25310# Army Foreign Science and Technology Center, Charlottesville, Va.
MATCHING OF OUTPUT PARAMETERS OF RADIOISOTOPE THERMOELECTRIC GENERATORS
A. Ya. Malyshiv, A. I. Ragozinskii, N. P. Korotkov, A. I. Dmitriev, and B. P. Sapelkin 3 Dec. 1974 10 p refs Transl. into ENGLISH from Tr. Vses. Nauch.-Issled. Inst. Radiats. Tekh. (USSR), no. 6, 1971 p 158-163
(AD-A008086; FSTC-HT-23-0209-75) Avail: NTIS CSCL 10/2

The authors discuss the use of semiconductor constant voltage converters as matching devices satisfying the requirements of a number of users fed from a radioisotope thermoelectric generator. GRA

N75-25311# Honeywell, Inc., Horsham, Pa. Power Sources Center.
LOW COST WATER ACTIVATED RESERVE BATTERY Final Report
M. J. Pollack Feb. 1974 35 p
(Contract N62269-72-C-0117)
(AD-A008053) Avail: NTIS CSCL 10/3

This technical report describes a development program to design and build a low cost, water activated battery. Organic oxidants theoretically attractive for use as cathode materials with magnesium anodes were evaluated and compared with presently used seawater battery systems. Increasing use of seawater activated batteries for surveillance buoys has given strong incentive to replacement of the conventionally used silver chloride cathodes with low cost non-strategic materials. The goal is the ultimate use of such a battery as a replacement in the SSQ-53 sonobuoy. GRA

N75-25312# Brown Univ., Providence, R.I. Dept. of Engineering.
INVESTIGATION OF THIN FILM SOLAR CELLS BASED ON Cu2S AND TERNARY COMPOUNDS Semiannual Progress Report, 1 Jan. 1974 - 30 Jun. 1974
Joseph J. Loferski, A. Wold, J. Shewchun, R. Arnott, and E. E. Crisman Jul. 1974 85 p refs
(Grant NSF GI-38102)
(PB-239526/7; NSF/RA/N-74-145; SAPR-1) Avail: NTIS HC $4.75 CSCL 10B

Properties of Cu2S and CuInS2 are analyzed. Theoretical considerations relevant to the photovoltaic effect in Cu2S Schottky barrier cell and in p-Cu2S/n-Si cells are reported. Characterization of Cu2S and CuInS2 by X-ray diffraction and cathodoluminescence and preparation of Cu2S films are described. Cathodoluminescence studies of copper-sulfur compounds and of CuInS2 are included. Method and system for determination of photovoltaic properties of cells are depicted. GRA

N75-25313# National Center for Energy Management and Power, Philadelphia, Pa.
INTERIM STANDARD FOR SOLAR COLLECTORS, FIRST DRAFT Semiannual Progress Report, 1 Jan. - 30 Jun. 1974
Noam Lior Jul. 1974 36 p
(Grant NSF GI-29729)
(PB-239757/8; NSF/RANN/SE/GI-29729D/PR-74-2; NSF/RA/N-74-152(2)) Avail: NTIS HC $3.75 CSCL 10B

This document is a first draft of a proposed standard which is to establish (1) methods for testing and evaluating solar collectors for water and space heating; and (2) a basis for their certification. It will provide manufacturers, distributors, installers, contractors and purchasers with a common understanding of these products. Considered are such subjects as: (1) scope and classification; (2) requirements; (3) inspection and test procedures; and (4) history of project. GRA

N75-25314# InterTechnology Corp., Warrenton, Va.
SOLAR ENERGY SCHOOL HEATING AUGMENTATION EXPERIMENT. DESIGN, CONSTRUCTION AND CONSTRUCTION AND INITIAL OPERATION Report, 16 Jan.-15 May 1974
4 Dec. 1974 84 p
(Grant NSF C-868)
(PB-239397/3; ITC-090974; NSF/RA/N-74-019) Avail: NTIS HC $4.75 CSCL 13A

The Fauquier High School Proof-Of-Concept experiment is described, a solar heating system, designed and built under the joint sponsorship of the National Science Foundation and InterTechnology Corporation. The system consists of a 2540 square foot collector array on a collector building 126 ft. by 26 ft., with a net absorber area of 2,415 square feet, two 5,500 gallon concrete, insulated storage tanks, a control room/pump house and an automatic control system. The solar heating system was designed to provide 100% of the heat required for five, modular construction classrooms. GRA

N75-25315# Oklahoma State Univ., Stillwater.
DEVELOPMENT OF AN ELECTRICAL GENERATOR AND ELECTROLYSIS CELL FOR A WIND ENERGY CONVERSION SYSTEM Progress Report
William Hughes, H. J. Allison, and R. G. Ramakumar 15 Oct. 1974 127 p refs
(Grant NSF GI-39547)
(PB-239272/8; NSF/RANN/SE/GI-39457/PR-74-3; NSF/RA/N-74-142) Avail: NTIS HC $5.75 CSCL 10B

Described is research whose purpose is threefold: (1) to develop and build a working generator system in the 10 to 20 kilowatt range (suitable for use with a windmill); (2) to develop and build a working high pressure moderate temperature electrolysis storage system, in the three kilowatt range: and (3) to construct, debug, and gain significant operational experience on a windmill farm. Included are reports on the following topics: Economical and technical aspects of wind generation systems, solar and wind energy systems for large scale power generation, of large scale utilization of solar and wind energy, and operation of parallel bridge rectifier systems with capacitors at bridge-inputs. GRA

N75-25316# Brown Univ., Providence, R.I. Dept. of Engineering.
INVESTIGATION OF THIN FILM SOLAR CELLS BASED ON Cu2S AND CuInS2 AND TERNARY COMPOUNDS Ph.D. Thesis
Steven David Mittleman Apr. 1974 113 p refs
(Grant NSF GI-38102)

(PB-239512/7; NSF/RANN/SE/GI-38102X/TR-74-1; NSF/RA/N-74-047) Avail: NTIS HC $5.25 CSCL 10B

The two semiconductor systems based on Cu2S and CuInS2 are studied. The use of cathodoluminescence as a nondestructive method of characterizing these materials is demonstrated. In the case of the Cu-S system it was found that of all the compounds tested only Cu2S emits a cathodoluminescence spectrum whose maximum lies at a photon energy corresponding to an energy gap of about 1.26eV. It is shown that such a spectrum is emitted by the thin Cu-S layer formed on p-Cu(x)S/n-Cds heterojunction solar cells as well as other Cu2S layers formed by sulfurization of Cu films. In the case of polycrystalline CuInS2 'stoichiometric' powders exhibited bands at 0.87 micrometers, 1.05 micrometers and 1.55 micrometers. GRA

N75-25317# Massachusetts Univ., Amherst.

TECHNICAL AND ECONOMIC FEASIBILITY OF THE OCEAN THERMAL DIFFERENCES PROCESS AS A SOLAR-DRIVEN ENERGY PROCESS Quarterly Progress Report, 1 Jan. - 31 Mar. 1974

William Heronemus 30 Apr. 1974 50 p refs Prepared in cooperation with United Aircraft Corp., East Hartford, Conn.
(Grant NSF GI-34979)
(PB-239374/2; NSF/RA/N-74-160; QPR-1) Avail: NTIS HC $3.75 CSCL 10B

One total system configuration for a 400 mWe ocean thermal power plant has been conceptualized. Enough work has been accomplished to show that the concept could be replicated in a broad swath in the Gulf Stream along the U.S. southeast coast. Subsystems have been reduced to diagrams and major components have been sized. A complete math model of the total heat engine cycle has been created and parametric studies are now possible with reasonable computer time expenditures. GRA

N75-25318# Massachusetts Univ., Amherst. Energy Alternatives Program.

OCEAN THERMAL DIFFERENCE POWER PLANT TURBINE DESIGN

L. L. Ambs and J. Marshall Nov. 1973 34 p refs
(Grant NSF GI-34979)
(PB-239371/8; NSF/RANN/SE/GI-34979/TR-13-17; NSF/RA/N-73-119) Avail: NTIS HC $3.75 CSCL 10B

Thermodynamic and fluid dynamic criteria are considered for an ocean thermal difference power plant turbine. The influence of the working fluid on the turbine design is discussed. Results of the study show that the actual size of the turbine used for any of the working fluids depends upon the site conditions and the heat exchanger design. Of the ten working fluids investigated, ammonia is found to be the preferred fluid. Propane requires a larger and slower unit of less power than ammonia but is also acceptable. GRA

N75-25319# Massachusetts Univ., Amherst. Energy Alternatives Program.

HEAT EXCHANGERS FOR SEA SOLAR POWER PLANTS

J. Hilbert Anderson Sep. 1973 48 p refs
(Grant NSF GI-34979)
(PB-239369/2; NSF/RANN/SE/GI-34979/TR-73/15; NSF/RA/N-73-137) Avail: NTIS HC $3.75 CSCL 10B

The following aspects of heat exchangers for solar sea power plants are considered: (1) exchanger requirements (heat flow, temperature difference, multiple circuits, boiling heat transfer, condensing heat transfer, water side heat transfer, marine fouling, corrosion, debris and leaks); (2) heat exchanger materials; (3) heat exchanger design; and (4) heat exchanger performance and cost. It is that costs of heat exchangers should not be a barrier to successful economics for solar sea power. GRA

N75-25320# National Center for Energy Management and Power, Philadelphia, Pa.

CONSERVATION AND BETTER UTILIZATION OF ELECTRIC POWER BY MEANS OF THERMAL ENERGY STORAGE AND SOLAR HEATING. SOLAR COLLECTOR PERFORMANCE STUDIES

Noam Lior and Alan P. Saunders Aug. 1974 126 p refs
(Grant NSF GI-27976)
(PB-239355/1; NSF/RANN/SE/GI-279976/TR-73-1; NSF/RA/N-74-188) Avail: NTIS HC $5.75 CSCL 10B

Comparative evaluation of 24 types of flat-plate solar collector configurations was performed. In addition to insolation collection tests, separate experiments were conducted to determine heat losses. The experimental facilities utilized are described. The various collector configurations were designed with a view to improving the absorption of solar energy and to reducing the heat losses from the collector window. The collectors, as well as the major materials used in their construction, were experimentally evaluated. GRA

N75-25321# National Bureau of Standards, Washington, D.C. Thermal Engineering Systems.

METHOD OF TESTING FOR RATING SOLAR COLLECTORS BASED ON THERMAL PERFORMANCE

James E. Hill and Tamami Kusuda Dec. 1974 64 p refs
(Grant NSF AG-493)
(COM-75-10276/4; NBSIR-74-635) Avail: NTIS HC $4.25 CSCL 10B

A study was made of the different techniques that could be used for testing solar collectors and rating them on the basis of thermal performance. This document outlines a standard test procedure based on that study. It is written in the format of a standard of the American Society of Heating, Refrigerating, and Air Conditioning Engineers and specifies the recommended apparatus, instrumentation, and test procedure. GRA

N75-25322# Illinois Univ., Urbana. Center for Advanced Computation.

US ENERGY AND FUEL DEMAND TO 1985, A COMPOSITE PROJECTION BY USER WITHIN PETROLEUM ADMINISTRATION FOR DEFENSE (PAD) DISTRICTS Final Report

Michael Rieber and Ronald Halcrow May 1974 173 p refs
(Grant NSF GI-35821)
(PB-239343/7; UIUC-CAC-DN-74-108R; NSF/RA/N-74-167) Avail: NTIS HC $6.25 CSCL 10A

Demand projections are presented for the years 1975, 1980 and 1985. These are subdivided by Petroleum Administration Defense (PAD) district, major consuming group within each district and the specific fuel. Fuel projections are presented on both a BTU and a commercial unit basis. Projections are a composite of several recent studies including those of the National Petroleum Council, Federal Power Commission, Bureau of Mines and National Economic Research Associates, Inc. Analyses of and comparisons among these studies are presented along with methodology for the present projection. GRA

N75-25323# Massachusetts Inst. of Tech., Cambridge. Energy Lab.

ENERGY CONSERVATION: A CASE STUDY FOR A LARGE MANUFACTURING PLANT Final Report

Lewis A. Felton and Leon R. Blicksman May 1974 111 p refs
(PB-239302/3; MIT-EL-74-010) Avail: NTIS HC $5.25 CSCL 10A

The methods of formulating, implementing, and evaluating a conservation program in a commercial building or light industrial plant are examined and the results of one case study are presented. In commercial and light industrial applications, most energy is consumed to maintain proper environmental conditions: light levels, heat levels, and fresh air levels. This report presents a method that can be used by many commercial and light industrial concerns to establish a conservation program. Guidelines are presented that can be used to examine environmental conditions and determine ways they must be changed. A system of program analysis is also presented. GRA

N75-25324# National Center for Energy Management and Power, Philadelphia, Pa.

PRELIMINARY INVESTIGATION INTO REGULATORY POWERS AND POLICIES ON ELECTRIC UTILITY PEAK LOAD PRICING

1974 54 p refs
(PB-239761/0; NSF/RA/N-74-152(6)) Avail: NTIS HC $4.25 CSCL 10A

The development of regulatory powers related to peak pricing and peak pricing policy is discussed along with possible modifications in national and state regulatory processes necessary to accommodate changes in rate structure. M.J.S.

N75-25325# Fluor Utah, San Mateo, Calif.
ECONOMIC SYSTEM ANALYSIS OF COAL PRECONVERSION TECHNOLOGY Interim Report, Aug. 1973 - Jun. 1974
Jan. 1975 388 p refs Prepared in cooperation with Bonner and Moore Associates Inc., Houston, Texas
(Contract DI-14-32-0001-1520)
(PB-239383/3; OCR-99-INT-1) Avail: NTIS HC $10.25; SOD HC as I63.10:99/INT-1 CSCL 08I

A comprehensive economic system analysis of coal preconversion technology to identify and define the physical, technical, social, economic, legal and environmental problems of producing 75,000 tons per day of coal from surface mines in the United States is described. Progress is reported in the collection of data on the geology of coal resources, mining equipment, processing equipment, socioeconomic and physioeconomic factors, and financial statistics. In addition, efforts are outlined for the development of a mathematical model to simulate mining operations and project the cost of various alternative cases. GRA

N75-25326# Battelle Columbus Labs., Ohio.
CHARACTERIZATION OF SULFUR RECOVERY FROM REFINERY FUEL GAS Final Report
J. M. Genco and S. S. Tam Jun. 1974 138 p refs
(Contract EPA-68-02-0611)
(PB-239777/6; EPA-450/3-74-055) Avail: NTIS HC $5.75 CSCL 07A

Processes for removing and recovering sulfur from refinery fuel gas are reviewed. Flowsheets, heat, and material balances for Claus sulfur recovery plants and commercially available processes for sulfur removal from Claus tail gas are presented. Statistics on sulfur recovery are presented. The environmental impact gas processes including emission reduction, liquid and solid by-products, and energy consumption is discussed. GRA

N75-25327# Pennsylvania State Univ., University Park. Dept. of Geosciences.
THE RELATION OF COAL CHARACTERISTICS TO COAL LIQUEFACTION BEHAVIOR
P. H. Given, W. Spackman, A. Davis, P. L. Walker, Jr., and H. L. Lovell Aug. 1974 98 p
(Grant NSF GI-38974)
(PB-239261/1; NSF/RA/N-74-154; Rept-2) Avail: NTIS HC $4.75 CSCL 07A

Various factors of coal are studied systematically to determine their relevancy to liquefaction behavior of coals and the character of the products. A continuous flow reactor, batch autoclaves, low pressure reaction vessels and other equipment are used in this investigation. This report runs from sample collection and characterization to characterization of mineral matter in coals by scanning electron microscope and preparation of maceral concentrations for liquefaction research. GRA

N75-25328# Bureau of Mines, Laramie, Wyo. Energy Research Center.
SHALE RETORTING IN A 150-TON BATCH-TYPE PILOT PLANT
A. E. Harak Dec. 1974 37 p refs
(PB-240263/4; BM-RI-7995) Avail: NTIS HC $3.75 CSCL 07A

To determine the retorting characteristics of a column of mine-run, ungraded oil shale ranging in size from fines to 5-ton pieces, a 150-ton retort was designed and constructed. Mine-run shale assaying about 25 gallons of oil per ton, was used as the test shale. The results of 10 runs of these are reported. In one run, the average particle size of the shale was substantially increased to determine its effect on oil yield. Oil recoveries ranged from a low of 39.3 to a high of 5.8 volume-percent of Fischer assay. GRA

N75-25329# Battelle Columbus Labs., Ohio.
VARIOUS RESEARCH TASKS RELATED TO ENERGY INFORMATION AND DATA ACTIVITIES: TASK 4 PRIORITIES ANALYSIS Final Report
David M. Liston, Jr., John W. Murdock, and Immanuel J. Klette 15 Nov. 1974 42 p
(Grant NSF GN-42243)
(PB-240424/2) Avail: NTIS HC $3.75 CSCL 05D

Priority actions for NSF to consider are defined in the field of energy research and development information. Energy policy, science policy, and information policy concepts were summarized and integrated to form a summary of energy research and development information policy concepts. GRA

N75-25330# National Bureau of Standards, Washington, D.C.
DIMENSIONS/NBS, VOLUME 59, NUMBER 2, FEBRUARY 1975 Monthly Technical News Bulletin
Feb. 1975 24 p
(COM-75-50141/02; LC-25-26527; NBS/DIM-59/2) Avail: NTIS MF $2.25; SOD HC as C13.13:59 CSCL 05B

Major technical developments in the areas of energy conservation, energy consumption, hazardous materials, and safety management are summarized. J.M.S.

N75-25331# Federal Energy Administration, Washington, D.C.
FIVE YEAR PROGRAM PLANNING DOCUMENT FOR END USE ENERGY CONSERVATION, RESEARCH, DEVELOPMENT, AND DEMONSTRATION
Douglas C. Bauer Jun. 1974 259 p refs
(PB-240406/9; FEA/PD-226-D) Avail: NTIS HC $8.50 CSCL 05A

The nation's resources are organized into task forces under national government leadership. Projects and funding needed for energy conservation studies in areas of transportation, industry, and building research are included. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N75-25332 British Library Lending Div., Boston Spa (England).
CONDENSATION OF SULPHURIC ACID FROM FLUE BASES AND MEASUREMENT BY ELECTRICAL DEWPOINT SENSORS
G. Mittelbach 14 May 1974 21 p refs Transl. into ENGLISH from VGB kraftwerkstechnik (West Ger.), v. 53, Oct. 1973 p 675-682
(BLL-CE-Trans-6412-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Limits of usefulness for dewpoint sensors measuring H_2SO_4 condensation are defined and their practical performance is described in theoretical terms. The relationship between H_2O and H_2SO_4 partial pressure in the flue gas is determined and the dewpoint pressure between these partial pressure and the equilibrium composition of the liquid is calculated. The rate of condensate layer development on the surface of the sensor and condensate composition are discussed, with emphasis on laws governing formation and on an estimation of corrosion rate. The possible relationship between rate of condensate layer growth and the increase in electrical conductivity with time is explored, and the influencing factors which might upset the layer growth and rise in conductivity are examined. Author

N75-25333 British Library Lending Div., Boston Spa (England).
INJURY TO FOREST ECOSYSTEMS AND AGROBIOCOENOSES UNDER THE INFLUENCE OF AIR POLLUTION IN INDUSTRIAL AREAS OF POLAND
Jan Paluch 11 Oct. 1974 7 p refs Transl. into ENGLISH from Polish report Presented at the 3d Intern. Clean Air Conf., Dusseldorf, 8-12 Oct. 1972
(BLL-CE-Trans-6387-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Industrial air pollution is discussed as a cause of disease conditions in trees and stands of timber. Interference with transpiration and CO_2 assimilation is seen as an inhibitor of tree growth, which leads to a reduction in the increase of wood bulk. Existing and possible future damage to timber is examined. Smoke damage effects on pests and forest fauna is noted. The effects of pollution on crop growth and yield are studied through tissue damage, phytotoxic factors, and soil degeneration. A system for clean air control and methods of adapting ecosystems to a changing environment are proposed. L.B.

N75-25334*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ATMOSPHERIC DIFFUSION PREDICTIONS FOR THE EXHAUST EFFLUENTS FROM THE LAUNCH OF A TITAN 3C, DECEMBER 13, 1973
J. Briscoe Stephens, ed. 27 Sep. 1974 81 p refs
(NASA-TM-X-64925) Avail: NTIS HC $4.75 CSCL 13B

Results for the predictions with the NASA/MSFC Multilayer Diffusion Model for the dispersive transport of the Titan 3C rocket exhaust effluents for the 1857 EST launch on December 13, 1973, from the Eastern Test Range at Cape Canaveral Air Force Station are presented. An atmospheric assessment is made in support of the joint Marshall Space Flight Center, Langley Research Center, and Kennedy Space Center rocket exhaust prediction and measurement program. The predictions are primarily intended to define a monitoring grid and for a postflight assessment of the field measurements in order to improve diffusion prediction techniques. Author

N75-25335# Oregon State Univ., Corvallis. Dept. of Chemistry.
ATMOSPHERIC TRACE ELEMENT ABUNDANCES AND THEIR APPLICATION IN AIR POLLUTION TRACING
Y. S. Shum and W. D. Loveland 1974 27 p refs Sponsored by ERDA and NIH
(RLO-2227-T7-27) Avail: NTIS HC $3.75

The atmospheric trace element abundances associated with examples of several major sources of air pollution in western Oregon, namely, a kraft process paper mill, a plywood manufacturer, and a metallurgical processor were measured using instrumental neutron activation analysis. Air samples were collected directly from industrial stacks and urban areas in Albany, Oregon using high-volume air samplers and tape samplers. The results show enriched concentrations of Zr, HF, Ta, As, Cl and Br in the metallurgical processor effluent, Na, Cl, Br, Cu, V, Co, Cr and Hg in the kraft process paper mill effluent, and Na, K, Cl, Cr, Cu, Br, and Hg in the plywood company effluent. The abundances of the elements Zr, Hf, Ta and As serve as unique tracers for the metallurgical processor stack effluent. Detailed mass balance calculations involving all the trace element abundances are used to statistically determine the stack effluent dispersal patterns of the three aforementioned concerns.
Author (NSA)

N75-25336# Institut Royal Meteorologique de Belgique, Brussels.
ATMOSPHERIC POLLUTION. PART 1: SMOKE AND SULFUR DIOXIDE. PART 2: PRECIPITATION MEASUREMENTS USING STORAGE GAGES Monthly Bulletin, Jul. 1973 [POLLUTION ATMOSPHERIQUE I.FUMEE ET SO2 II. MESURE DES RETOMBEES AU MOYEN DES JAUGES DE DEPOT BULLETIN MENSUEL, JUILLET 1973]
Jul. 1973 37 p In FRENCH and DUTCH Prepared jointly with Inst. d'Hyg. et d'Epidemiol.
Avail: NTIS HC $3.75

Data obtained at Belgian weather stations for July 1973 are tabulated. The air pollution apparatus and rain gage are briefly described. ESRO

N75-25337# Royal Netherlands Meteorological Inst., De Bilt.
METEOROLOGICAL INVESTIGATION ON THE PERIODS IN WHICH SERIOUS AIR POLLUTION MIGHT OCCUR [EEN ONDERZOEK NAAR PERIODES WAARIN METEOROLOGISCH GEZIEN ERNSTIGE LUCHTVERONTREINIGINGKAN OPTREDEN]
H. VanDop, A. P. VanUlden, and W. R. Raaff 1975 27 p refs In DUTCH; ENGLISH summary
(KNMI-WR-75-4) Avail: NTIS HC $3.75

An air pollution index called AVA (an abbreviation of air pollution potential) was developed in order to estimate the frequency in which the air in the Rijnmond area, Netherlands, may be seriously polluted. The AVA index, ranging from 0 to 100, is a measure for the dispersion of air pollution originating from many sources at various heights in an industrialized, highly populated region. It is assumed that when the index exceeds the value 50, the risk of serious air pollution increases. This assumption was confirmed by the index values of the smog period of September/October 1971. The climatological parameters were determined after a critical examination and reevaluation of the meteorological data collected at Zestienhoven (Rotterdam Airport) and from the soundings at De Bilt. ESRO

N75-25338# Air Force Weapons Lab., Kirtland AFB, N.Mex.
PRACTICAL FEASIBILITY EVALUATION OF COMBUSTING WASTE PETROLEUM OILS AND LUBRICANTS IN EXISTING HEATING PLANT BOILERS Final Report, 5 Jan. - 1 Jul. 1974
Ronald H. Kroop and Harold Elkin Feb. 1975 47 p refs
(AF Proj. 2103)
(AD-A007889; AFWL-TR-74-171) Avail: NTIS CSCL 13/2

Research has begun to evaluate the practical feasibility of combusting waste petroleum, oils, and lubricants (POL's) in existing heating plant boilers at three Air Force bases. The three bases are Seymour-Johnson, Loring, and McConnell AFB. This report describes the heating plants at the three bases, the types and quantities of waste POL's generated, and the waste POL transfer systems that were designed for each base. Economic analysis, as reported, indicates a definite and significant monetary savings that can be realized from reduced fuel oil and/or natural gas consumption by combusting waste POL's and taking advantage of their heating value. The test plan for actual several month evaluation of waste POL combustion at the three bases is described and includes air pollution sampling and identification of any operational problems. GRA

N75-25339# Department of Defense Explosives Safety Board, Washington, D.C.
METHODOLOGY FOR CHEMICAL HAZARD PREDICTION
Morris C. Johnson Oct. 1974 55 p refs
(AD-A008159; DDESB-TP-10) Avail: NTIS CSCL 04/1

The technical paper provides the recommended method for calculating hazard distances associated with chemical accidents or incidents for planning purposes. When given the agent source configurations, the method is a Gaussian Plume diffusion model, with (a) provisions for limiting the vertical expansion of the cloud to the surface mixing layer and (b) criteria to accommodate time-space variations of meteorological and other environmental factors. The basis for such a model results by treating atmospheric diffusion as an analogy to molecular diffusion. GRA

N75-25340# Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
ANALYSIS MODELS FOR SOLID WASTE COLLECTION, VOLUME 2
James F. Hudson, Donald S. Grossman, and David H. Marks Jan. 1975 225 p refs
(Grant EPA-801633)
(PB-239494/8; EPA-670/2-75-026b-Vol-2) Avail: NTIS HC $7.25 CSCL 13B

Analytic models are developed as aids in decision making at many points in the solid waste collection and haul system. Models for daily operating policy include breakdown or excess load, maintenance, and stochastic influences such as weather. Longer range issues include level of service, equipment, crew size, and work rules. The report develops an econometric model for prediction of waste output from census data for districts and daily collection areas. Documentation of the computer programs used and developed in the course of the work as well as the appendices to the main volume are reported. GRA

N75-25341# Environmental Research and Technology, Inc., Lexington, Mass.
HACKENSACK MEADOWLANDS AIR POLLUTION STUDY: SUMMARY REPORT Final Report
Byron H. Willis Jul. 1973 114 p refs Prepared in cooperation with New Jersey Dept. of Environmental Protection, Trenton
(Contract EPA-71-39)
(PB-238607/6; ERT-P-244-SR; EPA-450/3-74-056-a) Avail: NTIS HC $5.25 CSCL 13B

This report. Is the summary report. Its purpose is to present an overview of the procedures developed for considering air pollution in the urban and transportation planning process, and to describe the results of applying these procedures to the evaluation and ranking of the four alternative land use plans for the New Jersey Hackensack Meadowlands. GRA

N75-25342# Environmental Research and Technology, Inc., Lexington, Mass.
HACKENSACK MEADOWLANDS AIR POLLUTION STUDY: EMISSION PROJECTION METHODOLOGY Final Report
John C. Goodrich Oct. 1973 268 p refs Prepared in cooperation with New Jersey Dept. of Environmental Protection, Trenton
(Contract EPA-71-39)
(PB-238608/4; EPA-450/3-74-056-b) Avail: NTIS HC $8.50 CSCL 13B

Increasing recognition is placed on the importance of land use planning as a means of improving future air quality. A study was made to develop methods to assess the air pollution impact of land use plans, and to apply these methods to alternative land use plans for the New Jersey Hackensack Meadowlands as a case study. Environmental Research and Technology, Inc. designed a computer-oriented tool, which is intended for use by planners to incorporate air pollution considerations more directly into the planning process. One specific study objective was projecting to the year 1990 the total air pollutant emissions from an urbanized area. GRA

N75-25343# Environmental Research and Technology, Inc., Lexington, Mass.
HACKENSACK MEADOWLANDS AIR POLLUTION STUDY: DEVELOPMENT AND VALIDATION OF A MODELING TECHNIQUE FOR PREDICTING AIR QUALITY LEVELS Final Report
James R. Mahoney, Bruce A. Egan, and Edward C. Reifenstein, III Jun. 1973 91 p refs Prepared in cooperation with New Jersey Dept. of Environmental Protection, Trenton
(Contract EPA-71-39)
(PB-239626/5; ERT-P-244-2; EPA-450/3-74-056-c) Avail: NTIS HC $4.75 CSCL 13B

This report is the second of the five task reports. Its purpose is to describe the mathematical basis for predicting air quality levels for the New Jersey Hackensack Meadowlands. The report discusses both the development of the model and its validation and calibration. GRA

N75-25344# Environmental Research and Technology, Inc., Lexington, Mass.
HACKENSACK MEADOWLANDS AIR POLLUTION STUDY: EVALUATION AND RANKING OF LAND USE PLANS Final Report
Byron H. Willis Nov. 1973 278 p refs Prepared in cooperation with New Jersey Dept. of Environmental Protection, Trenton
(Contract EPA-71-39)
(PB-238606/8; ERT-P-244-3; EPA-450/3-74-056-d) Avail: NTIS HC $8.75 CSCL 13B

This report is the third of the five task reports. Its purpose is to describe the procedures developed for incorporating air pollution considerations into the formulation, evaluation, and ranking of alternative urban land use and transportation system plans and policies, and to describe the results of the evaluation and ranking of four alternative land use plans for 1990 for the New Jersey Hackensack Meadowlands. GRA

N75-25345# Environmental Research and Technology, Inc., Lexington, Mass.
HACKENSACK MEADOWLANDS AIR POLLUTION STUDY: AIR QUALITY IMPACT OF LAND USE PLANNING Final Report
Byron H. Willis, James R. Mahoney, and John C. Goodrich Jul. 1973 148 p refs Prepared in cooperation with New Jersey Dept. of Environmental Protection, Trenton
(Contract EPA-71-39)
(PB-239728/9; ERT-P-244-4; EPA-450/3-74-056-e) Avail: NTIS HC $5.75 CSCL 13B

This report is the fourth of the five task reports. Its purpose is to describe the set of planning guidelines for considering air pollution in the urban and transportation planning process as derived from the analysis of land use plans for the New Jersey Hackensack Meadowlands. GRA

N75-25346# Environmental Research and Technology, Inc., Lexington, Mass.
HACKENSACK MEADOWLANDS AIR POLLUTION STUDY: AQUIP SOFTWARE SYSTEM USER'S MANUAL Final Report
Edward C. Reifenstein, III, Robert J. Horn, III, and Michael J. Keefe Jun. 1974 423 p refs Prepared in cooperation with New Jersey Dept. of Environmental Protection, Trenton
(Contract EPA-71-39)
(PB-238605/0; ERT-P-244-5; EPA-450/3-74-056-f) Avail: NTIS HC $10.50 CSCL 13B

This report is the fifth of the 5 task reports. Its purpose is to describe the operational characteristics and requirements of the AQUIP software system developed and implemented in the course of this study. The report concentrates on procedures for using the software components of the system. Supplementary material consists of the FORTRAN IV source listings of the computer programs as implemented. GRA

N75-25347# California Univ., Berkeley. Lawrence Berkeley Lab.
DEVELOPMENT OF AIR PARTICULATE MONITORING SYSTEMS Final Report, Jan. 1973 - Jan. 1974
F. S. Goulding and J. M. Jaklevic May 1974 59 p refs
(Contract EPA-IAG-0377)
(PB-239690/1; EPA-650/4-74-030) Avail: NTIS HC $4.25 CSCL 07D

Progress is described for the first year of a two year effort to fabricate a high-speed areosol analysis system. An evaluation of a prototype virtual impactor for aerodynamically separating particles into two size ranges is given. Design improvements for minimizing losses are described. Design parameters are determined for a high-speed energy dispersive X-ray fluorescence spectrometer capable of analysis of elements with atomic numbers above 13. A prototype beta gauge for total mass determination is tested, and a detection limit of 10 microgram/sq cm is measured. For the purpose of sample identification, a system is described by which the X-ray spectrometer and the beta gauge are able to identify a digital code marked on each filter. GRA

N75-25348# Nuclear Regulatory Commission, Washington, D.C. Office of Special Studies.
NUCLEAR ENERGY CENTER SITE SURVEY: SCOPE OF WORK
13 Mar. 1975 28 p
(PB-240453/1; NUREG-75/018) Avail: NTIS HC $3.75 CSCL 18E

The scope of a study to conduct a national survey to identify potential nuclear energy center sites has been outlined by the Nuclear Regulatory Commission (NRC). The study will include evaluation of the technical feasibility and practicality of NEC's, and will be done in cooperation with Federal, State, and local government agencies. Three basic NEC concepts will be evaluated: (1) electric power generating centers with a capacity of from 12,000 to 48,000 MWe of installed capacity; (2) integrated fuel cycle centers with sufficient fuel reprocessing, fabrication, and waste management capacity to support from 50,000 to 300,000 MWe; and (3) various combinations of fuel cycle and electric generating facilities. GRA

N75-25349# Nuclear Regulatory Commission, Washington, D.C. Office of Nuclear Reactor Regulation.
ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED CALLAWAY PLANT UNITS 1 AND 2. UNION ELECTRIC COMPANY DOCKET NOS. STN 50-483 AND STN 50-486 Final Report
Mar. 1975 196 p refs
(PB-240193/3; NUREG-75/011) Avail: NTIS HC $7.00 CSCL 18E

A final environmental statement for the proposed Callaway plant units in Callaway County, Missouri has been prepared. This statement provides: (1) a summary of environmental impact and adverse effects of the proposed facility; and (2) a consideration of major alternatives. Also included are comments of Federal agencies and other state and local organizations. The NRC staff has concluded that construction permits could be granted for the proposed facility, subject to certain conditions for the protection of the environment. GRA

N75-25350# Institute for Defense Analyses, Arlington, Va.
THE PRODUCTION OF NITROGEN OXIDES BY LOW-ALTITUDE NUCLEAR EXPLOSIONS Final Report

F. R. Gilmore Jul. 1974 38 p refs
(Contract DOT-OS-30057)
(PB-239832/9; IDA/HQ-73-15738; P-988) Avail: NTIS HC $3.75 CSCL 18C

The production is reviewed of oxides of nitrogen in low-altitude atmospheric thermonuclear explosions. The total production rate of nitric oxide per megaton yield is estimated. During the late fireball (or nuclear cloud) rise, a significant fraction of the NO is converted to NO2 by slow reaction with O2, but the production of other nitrogen oxides, and of nitrous and nitric acid in moist air, is negligible. The variation, with yield or burst altitude, of the NOX produced per megaton is small for yields between 1 and 60 Mt, and altitudes bewteen sea level and a few kilometers. Estimates are made for the total NOx yield of the U.S. and U.S.S.R. nuclear tests during 1961-62. GRA

N75-25351# Argonne National Lab., Ill. Energy and Environmental Systems Div.
HANDBOOK OF AIR POLLUTANT EMISSIONS FROM TRANSPORTATION SYSTEMS Final Report
Richard R. Cirillo and Thomas D. Wolsko Dec. 1973 183 p refs Sponsored by ERDA
(PB-239614/1; ANL/ES-28; IIEQ-74-1) Avail: NTIS HC $7.00 CSCL 13B

Procedures for estimating the rate of air pollutant emissions from transportation systems is discussed. Emission factors and computation techniques for motor vehicles, railroad locomotives, aircraft, and waterborne vessels are presented. The major emphasis is on motor vehicle emission computations: and data on model year emission rates, control device deterioration, and vehicle speed adjustments are given. Procedures for separating cold start effects computing evaporative emission by source, and developing modewise emission factors are presented. TREFACT, a computer program designed to calculate motor vehicle emission factors, is described. GRA

N75-25352# Resource Planning Associates, Inc., Cambridge, Mass.
A STUDY OF FEDERAL SUBSIDIES TO STIMULATE RESOURCE RECOVERY Final Report
1974 144 p refs
(Contract EPA-68-03-0195)
(PB-239736/2; EPA-530/SW-96c) Avail: NTIS HC $5.75 CSCL 13B

Various aspects of Federal subsidies to stimulate resource recovery were examined conceptually and in light of past Federal experience. The characteristics of subsidies and the manner in which they affect the economics of secondary materials recovery and use are discussed along with estimates of costs and effectiveness of specific susbidies for stimulating recycling specific materials in municipal solid waste. Subsidies to stimulate secondary material use and those to stimulate construction of resource recovery plants to remove secondary materials from mixed municipal solid waste are described. The methodology used in making predictions of subsidy effectiveness is presented as well as description of the industry economic models to which they were applied. GRA

N75-25353# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
TECHNICAL SUPPORT DOCUMENT: EPA REGULATIONS FOR PREVENTING THE SIGNIFICANT DETERIORATION OF AIR QUALITY Final Report
Jan. 1975 121 p refs
(PB-240215/4; EPA-450/2-75-001) Avail: NTIS HC $5.25 CSCL 13B

A detailed explanation of the technical and policy considerations which form the basis for EPA's regulations for preventing the significant deterioration of air quality is given. The reasons for rejecting various alternative plans for preventing significant deterioration of air quality are discussed along with the basis for the air quality increments selected and the pollutants and sources covered. The impact of the regulations on general growth and development as well as on new energy sources is reported. GRA

N75-25354# Bureau of Mines, Pittsburgh, Pa. Safety Research Center.
METHANE EMISSION FROM U.S. COAL MINES IN 1973, A SURVEY Information Circular 1974
M. C. Irani, P. W. Jeran, and Maurice Deui Dec. 1974 52 p refs
(PB-240154/5; BM-IC-8659) Avail: NTIS HC $4.25 CSCL 13B

Daily methane emissions from U.S. coal mines are reported. It is indicated that total daily emissions have declined. GRA

N75-25355# Winston-Salem Dept. of Public Works, N.C.
AN EVALUATION OF LANDFILL GAS MIGRATION AND A PROTOTYPE GAS MIGRATION BARRIER Final Report
1975 154 p refs
(Contract EPA-S-801519)
(PB-239357/7; EPA-530/SW-79D) Avail: NTIS HC $6.25 CSCL 13B

A literature review is provided of landfill gas generation and movement and the state-of-the-art of landfill gas control technology. A review of the explosion attributed to ignition of migrating landfill gas in the North Carolina National Guard Armory on 27 September 1969 is given. The design, installation, evaluation and demonstration of a unique type of active gas barrier between the Link Road landfill and the Armory are described. The development of guideline considerations for gas barrier design and detection of landfill gas migration hazards are reported. GRA

N75-25356# Office of Water Resources Research, Washington, D.C. Scientific Information Center.
ACID MINE WATER, A BIBLIOGRAPHY
Feb. 1975 569 p refs
(PB-239523/4; WRSIC-75-202) Avail: NTIS HC $13.00 CSCL 13B

A planned bibliography in water resources is presented. Abstracts are given along with author and subject indexes. GRA

N75-25357# Mississippi-Alabama Sea Grant Consortium, Ocean Springs, Miss.
LAWS RELATING TO ENVIRONMENTAL CONTROL, PART 1
1973 149 p ref Prepared in cooperation with Mississippi Univ., University
(COM-75-10318/4; MASGP-74-029-Pt-1; NOAA-75021803) Avail: NTIS HC $5.75 CSCL 05D

The composition and general powers of agencies, commissions, and boards within the State of Mississippi exercising primary control over the environment of the marine and coastal zones are summarized. Duties, responsibilites, power and objectives are delineated for individual control agencies on state and local levels. Among the agencies delineated, included are, the State Board of Health, Air and Water Pollution Control Commission, Gulf Regional District, Board of Supervisors, County Port Authority, Land Commissioner, flood control districts, drainage districts, State Forestry Commission, Gulf Coast Research Laboratory, Game and Fish Commission, and the Marine Conservation Commission. GRA

N75-25358# Mississippi-Alabama Sea Grant Consortium, Ocean Springs, Miss.
LAWS RELATING TO ENVIRONMENTAL CONTROL, PART 2 Preliminary Draft
1973 141 p ref Prepared in cooperation with Mississippi Univ., University
(COM-75-10319/2; MASGP-74-030-Pt-2; NOAA-75021804) Avail: NTIS HC $5.75 CSCL 05D

Health and safety specifications and requirements directed toward private business and industry are discussed. Radiation control, building code maintenance, inspection of fire hazards, and compilation of health data are touched upon. Land-use regulations dealing with eminent domain, state and local zoning regulations, and airport location are included. Administrative agencies designated as watchdogs of pollution control within the state of Mississippi are specified along with their duties, responsibilities, powers, and composition. Limitations on fuel burning, open burning, incineration, and contaminant emissions are specified along with emergency control measures. Permit regulations for new and existing facilities discharging air contaminants are given. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N75-25359*# Lockheed Missiles and Space Co., Palo Alto, Calif.

COORDINATED ANALYSIS OF DATA Final Progress Report

S. B. Mende 27 Nov. 1974 48 p refs
(Contract NASw-2552)
(NASA-CR-142930) Avail: NTIS HC $3.75 CSCL 04A

All Sky Cameras (ASCA) observations were made at the field line conjugate of the ATS-5 Satellite. The field of view of these cameras covered the region of the magnetosphere from L=5 to L=ll at the approximate longitude of the ATS field line conjugate. Definite statements are made concerning the correlation of the auroras observed by the ASCA's and the magnetospheric trapped fluxes. No auroras are observed at the field line conjugate, on quiet days when the hot plasma does not penetrate into the magnetosphere far enough to reach the ATS-5 orbit. On more disturbed days, when the ATS-5 enters the plasma sheet containing plasma clouds, an equatorward motion of the lowest latitude auroral arc is observed. Significant qualitative correlation between the ASCA data and the trapped fluxes is observed when a local plasma injection event occurs near ATS-5. The clearest signature of the injection event is magnetic and is most pronounced as a recovery of a negative bay at the ATS-5 magnetometer. The most significant correlations are observed with the intensification of the diffuse uniform glow which intensifies during the injection event. Author

N75-25360*# Denver Univ., Colo. Dept. of Physics and Astronomy.

INTERPLANETARY FIELD AND PLASMA DURING INITIAL PHASE OF GEOMAGNETIC STORMS

V. L. Patel and M. J. Wiskerchen [1975] 31 p refs
(Grant NGR-06-004-123)
(NASA-CR-142859; DU-4963-7515) Avail: NTIS HC $3.75 CSCL 04A

Twenty-three geomagnetic storm events during 1966 to 1970 were studied by using simultaneous interplanetary magnetic field and plasma parameters. Explorer 33 and 35 field and plasma data were analyzed on large-scale (hourly) and small-scale (3 min.) during the time interval coincident with the initial phase of the geomagnetic storms. The solar-ecliptic Bz component turns southward at the end of the initial phase, thus triggering the main phase decrease in Dst geomagnetic field. The By component also shows large fluctuations along with Bz. When there are no clear changes in the Bz component, the By shows abrupt changes at the main phase onset. On the small-scale, behavior of the magnetic field and electric field were studied in detail for the three events; it is found that the field fluctuations in By, Bz and Ey and Ez are present in the initial phase. In the large-scale, the behavior field remains quiet because the small-scale variations are averaged out. It appears that large as well as small time scale fluctuations in the interplanetary field and plasma help to alter the internal electromagnetic state of the magnetosphere so that a ring current could causing a geomagnetic storm decrease. Author

N75-25361# National Physical Lab., New Delhi (India).

D-REGION IN DISTURBED CONDITIONS, INCLUDING FLARES AND ENERGETIC PARTICLES

A. P. Mitra Sep. 1974 59 p refs Presented at the STP Symp., Brazil, Jun. 1974
(RSD-87) Avail: NTIS HC $4.25

A unified picture of the chemistry of the normal and the disturbed D-region is presented. The disturbed conditions included are solar flares, PCAs and solar eclipses. Several areas of identity in the observational results for flares and PCAs are discussed in relation to the six ion model of Mitra and Rowe. These include: The dominance of q(O2 (+)) over q(NO (+)) due to X-rays and energetic particles respectively; drastic decrease in the effective loss coefficient during both flares and PCAs; disappearance of water cluster ions down to 73 km during day and 78 km at night during PCAs; the reversion of negative ions to their basic forms (O (-) and O2 (-)) during PCAs. For solar eclipses, the effects are essentially a mirror image of those due to flares and PCAs. Author

N75-25362# National Physical Lab., New Delhi (India).

THE INADEQUACIES OF SOLAR X-RAY FLUX IN 1-100 A BAND FOR PRODUCTION OF IONIZATION IN THE LOWER E REGION

A. P. Mitra, J. N. Rowe (Pennsylvania State Univ., Univ. Park), and R. W. Kreplin (US Naval Research Labs., Washington, D.C.) Sep. 1974 21 p refs Presented at the COSPAR meeting, Sao Paulo, Brazil, 22 Jun. - 1 Jul. 1974
(RSD-88; COSPAR-Paper-4B.1.10) Avail: NTIS HC $3.25

Flux values for wavelengths < 100 A are shown to be insufficient in producing ionization in the regions between 90 to 130 km observed with rocket-borne techniques or with incoherent scatter measurements. Flux values are derived for 44 to 60 A from the full complement of soft X-ray detectors. Experiments conducted aboard SOLARDs 7B, 8 and 10, OGO-4 and OGO-5 during non-flaring time from 1965 through 1971 and separately for minimum, moderate and high solar activity periods are studied. Flux models with two different types of adjustments for wavelengths > 100 A are found to be in good agreement with observational results on ionization and ion composition in the region. Author

N75-25363# National Physical Lab., New Delhi (India).

ON MEASURING STRATOSPHERIC NITRIC OXIDE USING BALLOON-BORNE LYMAN-ALPHA AND GERDIEN CONDENSER

M. Nalinimohan Rao and D. K. Chakrabarty Oct. 1974 30 p refs
(RSD-89) Avail: NTIS HC $3.75

A procedure which uses zero pressure high altitude balloons to measure the NO concentration of the stratosphere is described. The technique is based on artificially ionizing NO molecules with a Lyman-alpha discharging lamp and measuring the positive ion density thus produced with a Gerdien condenser. J.M.S.

N75-25364# Joint Publications Research Service, Arlington, Va.

POSSIBILITIES AND PROSPECTS OF METHODS OF LASER PROBING OF THE ATMOSPHERE

V. Ye. Zuyev 15 May 1975 15 p Transl. into ENGLISH from Lazer-Meteorolog (Leningrad), 1974 p 155-173
(JPRS-64771) Avail: NTIS HC $3.25

The effect of various factors, both qualitative and quantitative, on the efficiency of laser probing of the atmosphere was investigated. The factors discussed include output and length of the radiation pulse, radiation spectrum, angle of divergence of the source, the angle of the visual field, radiation losses in the optical channel of the lidar, width of the bandpass or narrowband filter, the sensitivity of the receiving channel, laser pulse-atmosphere interactions, and noise in the atmosphere and in the radiation detector. Author

N75-25365*# Scientific Translation Service, Santa Barbara, Calif.

INFLUENCE OF THE ATMOSPHERE ON THE SPECTRAL BRIGHTNESS AND CONTRAST OF NATURAL FORMATIONS WITH SPECTROPHOTOMETRIC MEASUREMENTS OF EARTH FROM SPACE

K. Ya Kondrat'yev, A. A. Buznikov, O. B. Vasilyev, and O. I. Smoktiy Washington NASA Jun. 1975 30 p refs Transl. into ENGLISH from Fiz. Atmosfery i Okeana (USSR), v. 11, no. 4, 1975 p 348-361
(Contract NASw-2483)
(NASA-TT-F-16403) Avail: NTIS HC $3.75 CSCL 04A

The influence of the atmosphere on spectral brightnesses and contrasts of natural formations during spectrophotometric measurements of the earth from space in the visible spectral region is considered. The problem of theoretical and experimental determination of the atmospheric transfer function for the cases of practical interest is stated and solved. The technique for the determination of transfer functions and their components from the results of combined subsatellite experiments is discussed. A comparison was made of the experimental data obtained on Soyuz-7 and Soyuz-9 spacecrafts and of the corresponding theoretical calculations. Considerable influence of the nonuniformity of the underlying surface near the boundary of two media (sand-sea, sand-cloudiness) on the transformation of brightnesses and contrasts to the level of the upper atmosphere boundary is shown. Author

N75-25366*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DATA FOR NASA'S AVE 3 EXPERIMENT: 25-mb SOUNDING DATA AND SYNOPTIC CHARTS
Henry E. Fuelberg (Texas A and M Univ., College Station) and Robert E. Turner Jun. 1975 465 p refs
(Contract NAS8-26751)
(NASA-TM-X-64938) Avail: NTIS HC $11.50 CSCL 04A

The atmospheric variability experiment (AVE 3) is described and tabulated rawinsonde data at 25-mb intervals from the surface to 25 mb for the 41 stations is presented. The experiment was conducted between February 6 and February 7, 1975. Brief discussions are given on methods of data processing, changes in the reduction scheme since the AVE 2 pilot experiment, and data accuracy. An example of contact data is presented as well as synoptic charts prepared from the data. Author

N75-25367# Royal Aircraft Establishment, Farnborough (England).
AN OBSERVATION ON SPANWISE DISTRIBUTION OF VERTICAL ATMOSPHERIC TURBULENCE
K. Ono, T. Sotozaki, K. Takeuchi, and K. Yamane Jan. 1975 35 p refs Transl. into ENGLISH from the Japanese report NAL-TR-346
(RAE-Lib-Trans-1820; BR47555; NAL-TR-346) Avail: NTIS HC $3.75

In the design calculation of airplane response to vertical atmospheric turbulence, spanwise distribution of turbulence velocities is assumed to be uniform both in discrete gust method and in power spectral method. The actual spanwise distribution, however, is not uniform, and theoretical analyses of two-dimensional power spectral method are applied with the assumption that the atmospheric turbulence is isotropic. In order to investigate the applicability of the assumption on the spanwise distribution in both methods, the vertical turbulence velocities were measured by an airplane at the nose and wing tips. Vertical velocity correlations along the flight path and the span were compared with each other and with the theoretical value by von Karman model. The data measured at three points were analyzed to see the deviation from the assumption of spanwise uniform distribution by cross spectral method. Author

N75-25368*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
GEOPHYSICAL DATA BASE
M. R. Williamson and L. R. Kirschner Feb. 1975 98 p
(Grant NGR-09-015-002)
(NASA-CR-142960; SAO-409-093) Avail: NTIS HC $4.75 CSCL 08E

A general data-management system that provides a random-access capability for large amounts of data is described. The system operates on a CDC 6400 computer using a combination of magnetic tape and disk storage. A FORTRAN subroutine package is provided to simplify the maintenance and use of the data. Author

N75-25369# Sandia Labs., Albuquerque, N.Mex.
STRESS WAVE MEASUREMENTS IN EARTH PENETRATOR EXPERIMENTS
G. A. Carlson Dec. 1974 62 p refs
(Contract AT(29-1)-789)
(SAND-74-0257) Avail: NTIS HC $4.25

Stress waves in the soil medium were measured during earth penetrator experiments using lithium niobate gauges. Experiments were conducted at the McCormick Ranch site near Albuquerque, New Mexico, and at the Watching Hill site near Suffield, Alberta, Canada. In the Watching Hill experiments, a 0.152 m dia, 127 kg penetrator traveling at a velocity of 156 m/s generated stress waves ranging from 0.6 MPa at a horizontal distance of 0.45 m to 0.025 MPa at 1.2 m. Agreement of the measured stress wave amplitude, wave shape, and arrival time with calculations based on a soil cap model is good. Author (NSA)

N75-25370# California Univ., Livermore. Lawrence Livermore Lab.
TECHNIQUE TO ENHANCE CRACK GROWTH AND INCREASE PERMEABILITY IN GEOLOGICAL MEDIA
H. D. Glenn 13 Jan. 1975 10 p refs
(Contract W-7405-eng-48)
(UCID-16663) Avail: NTIS HC $3.25

Results from a series of high explosive tests in Playa alluvium at the Nevada Test Site are examined. Based on these results, an explosive fracture technique (using high explosives and rocket propellant) is proposed to enhance crack growth and increase the permeability of geological media. Late-time cavity gases provided by the propellant should sustain crack growth. Five experiments are designed to further explore the technique. Author (NSA)

N75-25371# Institut Royal Meteorologique de Belgique, Brussels.
OZONE OBSERVATIONS Quarterly Report, 1971 [OBSERVATIONS D'OZONE 1ER TRIMESTRE 1971]
1974 48 p refs In FRENCH and DUTCH
(QR-1) Avail: NTIS HC $3.75

Spectrophotometric ozone measurements are reported for the first quarter of 1971. The presented ozonograms contain designations for partial ozone pressure and atmospheric diffusion, air temperature, and used wavelengths. ESRO

N75-25372# Institut Royal Meteorologique de Belgique, Brussels.
OZONE OBSERVATIONS Quarterly Report, 1971 [OBSERVATIONS D'OZONE 2EME TRIMESTRE 1971]
1974 52 p refs In FRENCH and DUTCH
(QR-2) Avail: NTIS HC $4.25

Spectrophotometric ozone measurements are reported for the second quarter of 1971. The presented ozonograms contain designations for partial ozone pressure and atmospheric diffusion, air temperature, and used wavelengths. ESRO

N75-25373# Institut Royal Meteorologique de Belgique, Brussels.
GEOPHYSICAL OBSERVATIONS Monthly Bulletin, Aug. 1974 [OBSERVATIONS GEOPHYSIQUES BULLETIN MENSUEL, AOUT 1974]
Aug. 1974 26 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Geophysical data obtained at Dourbes (Belgium) relating to geomagnetism, air radioactivity, ionospheric parameters, seismology, atmospheric electricity, and cosmic rays during August 1972 are presented. ESRO

N75-25374# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly Bulletin, Aug. 1974 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, AOUT 1974]
Aug. 1974 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Results of ionospheric and cosmic ray (neutron component) observations at Dourbes (Belgium) are tabulated for August 1974. ESRO

N75-25375# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly Bulletin, Sep. 1974 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, SEPTEMBRE 1974]
Sep. 1974 31 p In DUTCH and FRENCH
Avail: NTIS HC $3.75

Results of ionospheric and cosmic ray (neutron component) observations at Dourbes (Belgium) are tabulated for September 1974. ESRO

N75-25376# Technische Universitaet, Munich (West Germany).
PRACTICE, RESULTS AND FURTHER PROJECTS OF THE DEPARTMENT 78 SATELLITE GEODESY OF THE TECHNI-

CAL UNIVERSITY MUNICH [DER SONDERFORSCHUNGSBEREICH 78 SATELLITENGEODAESIE DER TECHNISCHEN UNIVERSITAET MUENCHEN, ARBEITSWEISE, ERGEBNISSE UND WEITEREVORHABEN]
R. Sigl 1973 27 p refs In GERMAN
(TUM-MITT-116) Avail: NTIS HC $3.75

A general description of the principles and objectives of satellite geodesy is given, and the research program of the department is explained. ESRO

N75-25377# Office of Naval Research, London (England).
MEETING FOR DISCUSSION. THE THEORY OF ELECTRIC AND MAGNETIC WAVES IN THE IONOSPHERE AND THE MAGNETOSPHERE
Martin S. Harris 3 Feb. 1975 10 p Conf. held at London, 5-6 Dec. 1974
(AD-A006657; ONRL-C-1-75) Avail: NTIS CSCL 04/1

A two-day meeting for discussion to mark the fiftieth anniversary of radio investigations of the ionosphere was sponsored by the Royal Society and URSI in London on 5-6 December 1974. Abstracts of papers presented on the early history of ionospheric investigations as well as those on the theory of electric and magnetic waves in the ionosphere and magnetosphere are given. GRA

N75-25378# Alaska Univ., College. Geophysical Inst.
GEOPHYSICAL DESCRIPTION AND AVAILABLE DATA ASSOCIATED WITH ROCKET PF-PT-81 Interim Report
Gerald J. Romick Oct. 1974 43 p ref
(Contract F19628-74-C-0188)
(AD-A008496; AFCRL-TR-74-0540; SR-1) Avail: NTIS CSCL 04/1

This report describes the general auroral activity associated with the launch of rocket PF-PT-81 on U.T. April 18, 1974 at Poker Flat Research Range. Included are peripheral data pertinent to the launch, atmospheric meteorology, and ground station instrumentation operation. GRA

N75-25379# General Electric Co., Philadelphia, Pa. Space Div.
A POCKET MANUAL OF THE PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE EARTH'S ATMOSPHERE
C. A. Blank, T. Baurer, M. H. Bortner, and A. A. Feryok 1 Jul. 1974 279 p
(Contract DNA001-73-C-0146; DNA Proj. NWED-S99QAXH)
(AD-A008098; DNA-3467H) Avail: NTIS CSCL 04/1

This publication is a pocket-sized extract of information contained in The Reaction Rate Handbook (DNA 1948H), Revised Edition, and other sources, and is a compendium of useful data for the convenience of atmospheric chemists, physicists, etc. The manual is broken down into five major categories; vis, Atmospheric Characteristics, Chemical Reactivity Data, Radiation Data, Electromagnetic Propagation Data, and Constants and Conversion Factors. GRA

N75-25380# Photometrics, Inc., Lexington, Mass.
QUANTITATIVE OPTICAL DATA ANALYSIS ON CHEMICAL RELEASES Final Report, 1 Jan. - 31 Dec. 1974
Christian A. Trowbridge, Ronald H. Johnson, Irving L. Kofsky, and John W. Meriwether 31 Jan. 1975 39 p refs
(Contract F19628-74-C-0045; AF Proj. 7635)
(AD-A008501; PHM-101-75; AFCRL-TR-75-0058) Avail: NTIS CSCL 04/1

Winds, temperatures, diffusive and turbulent transport, composition, and chemical reaction processes in the stratosphere, mesosphere, and thermosphere are studied by means of photographic and photoelectric photometry of tracer materials released from rockets and aircraft. The principal quantities measured by photographic photometry are atmospheric diffusion coefficients and concentrations of molecules and atoms, winds and turbulent mixing, inventories and reaction rates of release particles with ambient species. GRA

N75-25381# Army Electronics Command, Fort Monmouth, N.J.
STRATOSPHERIC COMPOSITION BALLOON-BORNE EXPERIMENT 18 SEPTEMBER 1972
Harold N. Ballard and Frank P. Hudson Jan. 1975 119 p refs
(AD-A008021; ECOM-5554) Avail: NTIS CSCL 04/1

Contents: Summary of state of health measurements, stratospheric composition balloon experiment; Atmospheric temperatures measured near 48 kilometers by balloon-borne thermistors; Stratospheric balloon pressure measurements and derived density in the 40- to 48-kilometer altitude interval; Ozone particle densities measured by chemiluminescent sensors on a balloon at 48 kilometers; Solar ultraviolet irradiance and ozone particle concentration observations at 48-kilometer balloon-float altitude; A comparison of measured and calculated ozone particle densities during sunrise; Determination of neutral constituent concentrations in 45- to 60-kilometer interval with rocket- and balloon-borne samplers; Electrical conductivity measurements from the September 1972 stratospheric balloon experiment; Water vapor measurements during a 48-KM balloon flight; Solar and cosmic radiation prevailing during the September 1972 stratospheric balloon experiment; Mass spectrometer data. GRA

N75-25382# Alaska Univ., College. Geophysical Inst.
REPORT ON THE GEOPHYSICAL DESCRIPTION AND AVAILABLE DATA ASSOCIATED WITH ROCKET PF-BB-53 Scientific Interim Report
Gerald J. Romick Jan. 1975 44 p ref
(Contract F19628-74-C-0188)
(AD-A008500; SR-2; AFCRL-TR-75-0040) Avail: NTIS CSCL 04/1

This report describes the general auroral activity associated with the launch of rocket PF-BB-53 on U.T. March 22, 1973 at Poker Flat Research Range. Included in this report are peripheral data pertinent to the launch, atmospheric meteorology and ground station instrumentation operation. GRA

N75-25383# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MODERN PHOTOCHEMICAL THEORY AND EXPLANATION OF THE BEHAVIOR OF THE ION CONCENTRATION ABOVE 100 KM
A. D. Danilov and M. N. Vlasov 22 Jan. 1975 305 p refs
Transl. into ENGLISH of the book "Fotokhimiya ionizovannykh i vozbuzhdennykh chastits v nizhnei ionosfere" Leningrad, Izd vo Gidrometeoizdat, 1973 p 1-190
(AD-A007920; FTD-HC-23-2158-74) Avail: NTIS CSCL 04/1

Modern problems of upper atmosphere photo-chemistry are examined, which are now mainly concentrated in the region of the lower ionosphere (50-200 km). The arrangement of the processes, which govern the behavior of ionized particles at different levels of the lower ionosphere, is presented and discussed. A detailed analysis is given of the variations in the ion composition and the connection between the behavior of neutral and ionized particles is studied. A detailed description is given for the new trends in atmospheric photochemistry, i.e., the study of the reactions with excited particles. Both sides of the problem are considered: the photochemistry of excited atoms and molecules itself, and the contribution of these particles to such important questions of the physics of the ionization, electron balance, and nitric oxide formation. GRA

N75-25384# Aerospace Corp., El Segundo, Calif.
AN IMPROVED PHENOMENOLOGICAL MODEL OF IONOSPHERIC DENSITY Interim Report
Y. T. Chiu 26 Mar. 1975 55 p refs
(Contract F04701-74-C-0075)
(AD-A008175; TR-0075(5260-10)-4; SAMSO-TR-75-94) Avail: NTIS CSCL 04/1

A global representation of the large scale variations of ionospheric electron density with the annual, diurnal and solar activity cycles is described. The phenomenological model, requiring minimal computer storage space, is constructed from monthly-averaged hourly ionospheric sounding data from some 50 stations during the epoch 1957-1970, as provided by World Data Center (A). The model, describing noontime F2 layer critical frequencies to better than 2 MHz average maximum error and to better than 0.5 MHz root mean squared error, is particularly suitable for applications in space communication and ionosphere-atmosphere coupling studies. GRA

N75-25385# Naval Research Lab., Washington, D.C.
THEORETICAL AND NUMERICAL SIMULATION STUDIES

OF MIDLATITUDE F REGION IRREGULARITIES Interim Memorandum Report
A. J. Scannapieco, S. L. Ossakow, S. R. Goldman, D. L. Book, and B. E. McDonald Mar. 1975 30 p refs
(NRL Proj. A03-16; RR0330242)
(AD-A008545; NRL-MR-3014) Avail: NTIS CSCL 04/1

A set of moment equations first derived by Perkins (1973) which describes the dynamical behavior of the nighttime F region is discussed. In addition, a plausible equilibrium state is described and a linear perturbation analysis is carried out under conditions in which F region irregularities can develop. A delineation of the differences between the author's equilibrium and perturbation analysis and that of Perkins (1973) is presented. Numerical simulations of the nonlinear evolution of the dynamical equations for a portion of the nighttime F region are presented and discussed. GRA

N75-25386# Lincoln Lab., Mass. Inst. of Tech., Lexington.
MILLSTONE HILL THOMSON SCATTER RESULTS FOR 1969
John V. Evans 23 Jul. 1974 144 p refs
(Contract F19628-73-C-0002; DA Proj. 7X2-63304-D-215)
(AD-A008505; TR-513; ESD-TR-74-234) Avail: NTIS CSCL 04/1

This report summarizes the results for the electron density distribution, electron and ion temperatures and vertical ionization fluxes in the F-region obtained during 1969 using the Millstone Hill (42.6 degrees N, 71.5 degrees W) Thomson (incoherent) scatter radar system. These data, for the height interval approximately 200 to 900 km, were gathered over 24-hour observing periods, roughly twice per calendar month. The time resolution to obtain results over this entire height interval was either 30 or 45 minutes, depending upon which of two operating modes was employed. GRA

N75-25387# Emmanuel Coll., Boston, Mass.
SATELLITE BEACON STUDIES. 1: TOTAL ELECTRON CONTENT. 2: SCINTILLATION STUDIES. 3: PROGRAMMING
Robert L. Vesprini, Eileen Martin, Charles Cantor, and M. Patricia Hagan Nov. 1974 61 p refs
(Contract F19628-72-C-0305; AF Proj. 4643)
(AD-A008193; AFCRL-TR-75-0069; SR-1) Avail: NTIS CSCL 04/1

This report provides information on (1) Total Electron Content (TEC) studies and their relationship to magnetic disturbances; (2) incidence of, and intensity of scintillations, as studied through indices; (3) programming techniques for handling scintillation indices. GRA

N75-25388# Texas Instruments, Inc., Dallas. Equipment Group.
AN INTERACTIVE SYSTEM FOR LONG PERIOD SEISMIC PROCESSING. TECHNICAL REPORT NO. 11: VELA NETWORK EVALUATION AND AUTOMATIC PROCESSING RESEARCH
Frode Ringdal and Jeffrey S. Shaub 10 Dec. 1974 56 p refs
(Contract F08606-74-C-0033; ARPA Order 2551)
(AD-A008280; TI-ALEX(01)-TR-74-11) Avail: NTIS CSCL 17/10

The report describes an interactive graphics processing system developed for the PDP-15 computer at the Seismic Data Analysis Center. The system is designed to process long-period seismic data and includes options for interactive bandpass filtering, matched filtering, spectral analysis and parameter measurements. The main intention of the program development has been to investigate the feasibility of using interactive graphics for event detection purposes in a potential world-wide seismic surveillance system. An evaluation of the expected operational capabilities of the system has been carried out, using data recorded by the Very Long-Period Experiment network as a source. Conclusions from this evaluation and recommendations for future study are presented. GRA

N75-25389# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A SONIC ANEMO-THERMOMETER FOR MEASURING VERTICAL FLUX OF SENSIBLE HEAT IN THE ATMOSPHERIC BOUNDARY LAYER
J. Lidl and H. Loebel 25 Feb. 1975 80 p refs Transl. into ENGLISH from Deut. Luft Raumfahrt, Mitteilung (Munich), v. 74, no. 07, 1974 p 1-53
(AD-A007929; FTD-HC-23-0882-75) Avail: NTIS CSCL 04/2

Proceeding from the known heat flux equation which describes the relationship between the turbulent, vertical flux of sensible heat in the atmospheric boundary layer and the fluctuation components of meteorological parameters, a measuring device was developed and constructed which can be used for the direct determination of vertical flux of sensible heat. The fluctuation values of the air temperature and vertical wind component are measured by the sonic-anemo-thermometer which is described. The product of both test values is found by continuous successive multiplication in an analog computing device. This product is proportional to the vertical flux of sensible heat. Author

N75-25390# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE FREQUENCY OF SUPER-REFRACTIVE LAYERS OVER MIDDLE EUROPE
M. Koch 18 Feb. 1975 21 p refs Transl. into ENGLISH from Deutsche Luft-Raumfahrt (Munich), no. 171, 1972 p 24-27
(AD-A007926; FTD-HC-23-0710-75) Avail: NTIS CSCL 04/2

A computer program used to evaluate the results of radiosonde ascents is discussed. Means values derived for the appearance of super-refractive layers are presented in relation to weather conditions, altitudes, and intensity gradient for the month and time of ascent. J.M.S.

N75-25391# Air Weather Service, Scott AFB, Ill.
SEASONAL EFFECTS ON SUDDEN PHASE ANOMALY NORMALIZATION
Edward W. Cliver Jan. 1975 30 p refs
(AD-A008278; AWS-TR-75-256) Avail: NTIS CSCL 04/1

The size of a Sudden Phase Anomaly (SPA) corresponding to a given incident X-ray flux depends on the time of day of the event, the season of the year, the length of the path considered and the radiation spectrum. It is necessary to determine the influence of each of these factors if the measured phase advance is to serve as an accurate indicator either of the size of the ionospheric disturbance or of the magnitude of the responsible flare. In the paper the effect of changing season is considered. For a given X-ray flux and solar zenith angle, it is found that the D-layer is more responsive in summer than in winter. GRA

N75-25392# Visidyne, Inc., Burlington, Mass.
EXCITATION OF INFRARED ACTIVE ATMOSPHERIC SPECIES BY GROUND BASE RF TRANSMITTERS Final Report, 1 Jun. 1973 - 31 Jul. 1974
Oscar P. Manley 20 Jan. 1975 49 p refs
(Contract DNA001-73-C-0263; DNA Proj. NWET-L25AAXY)
(AD-A008210; VI-252; DNA-3543F) Avail: NTIS CSCL 04/1

The use of existing experimental facilities for E-region modification has been assessed in the context of exciting IR active atmospheric species (e. g. NO) in the ionosphere. A brief review of pertinent airglow measured from the modified F-region is given and the elements of the theory necessary to explain the observations are outlined. It is shown that even if the non-linear aspects of the theory of ionospheric modifications are ignored, the existing facilities at Platteville, Colorado, should be capable of generating enhanced NO emissions in the E-region which should be observable from aircraft altitudes. Existing sparse data from E-region modification experiments suggest that the effects of non-linearities cannot be ignored. Hence, the estimates presented here should be viewed as a lower bound on emission levels. GRA

N75-25393# International Business Machines Corp., Burlington, Mass. Federal Systems Div.
PROGRAM STRUCTURE OF ATMOSPHERIC DENSITY PROGRAMS Final Report, 1 Jan. 1972 - 31 Jan. 1975
Arnold S. Bramson 15 Feb. 1975 101 p refs
(Contract F19628-72-C-0178; AF Proj. 8605)
(AD-A008515; AFCRL-TR-75-0063) Avail: NTIS CSCL 04/1

Two extensive computer programs have been designed and developed by IBM for AFCRL under the existing and previous contracts. These are the Cambridge Atmospheric Density Numerical Integration Program (CADNIP) and the Burlington Atmospheric Density Model Evaluation Program (BADMEP). CADNIP is an automatic computer program capable of determining atmospheric densities from an analysis of satellite observations. CADNIP contains a numerical integration scheme combined with a differential correction procedure where the discrepancies between computer and observed position and velocity are reconciled by adjusting the assumed atmospheric model, thereby yielding corrected or refined density data. BADMEP is a computer program for testing and evaluating atmospheric models. An important feature of BADMEP is an analytical ephemeris generator which may be used in place of numerical integration resulting in a considerable reduction in required computer time. GRA

N75-25394# Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.
EFFECTS OF CRUSTAL FEATURES ON THE GRAVITY FIELD AND ISOSTATIC COMPENSATION Final Report, 1 Apr. 1972 - 30 Jun. 1974
Leland T. Long Dec. 1974 12 p refs
(Grants DAHC04-74-G-0003; DA-ARO(D)-31-124-71-G117)
(AD-A008112; AROD-9110.4-EN) Avail: NTIS CSCL 08/7

The effects of crustal features and major geologic units on gravity anomalies and on isostatic compensation are investigated. The study of isostatic compensation used the theory of Dorman and Lewis in which topographic features were assumed to be related linearly to compensation and its corresponding Bouguer anomaly. An isostatic response function was derived directly from the relation between topography and Bouguer anomalies in the southeastern United States. GRA

N75-25395# Royal Norwegian Council for Scientific and Industrial Research, Kjeller.
PRECURSORS TO PP, PHASE 3
D. W. King, R. A. W. Haddon (Sydney Univ.), and E. S. Husebye 28 Feb. 1975 60 p refs
(Contract F08606-74-C-0049; ARPA Order 2551)
(AD-A008180; NORSAR-Scientific-3-74/75) Avail: NTIS CSCL 17/10

The results of a theoretical study of the interpretation of precursors to PP (delta approximately equals 100 deg) in terms of scattering by small-scale random irregularities in the crust and uppermost mantle are presented. These results are compared with observational data from two nuclear explosions recorded at the Warramunga array and three earthquakes recorded at the NORSAR array. This comparison reveals that the scattering interpretation offers a plausible and adequate explanation of the detailed observational data, namely: onset times, duration, slowness, azimuth and amplitude variations. The scattering interpretation of PP precursors, along with a similar interpretation of precursors to PKPPKP, removes the need for postulating sharp reflecting discontinuities in the uppermost few hundred kilometers of the crust and upper mantle. GRA

N75-25396# National Academy of Engineering, Washington, D.C.
EARTHQUAKE ENVIRONMENT SIMULATION: PROCEEDINGS OF A WORKSHOP ON SIMULATION OF EARTHQUAKE EFFECTS ON STRUCTURES Final Report
Feb. 1974 284 p refs Conf. held in San Francisco, 7-9 Sep. 1973
(Contract NSF C-310)
(PB-240404/4; NSF/RA/T-74-002) Avail: NTIS HC $8.75 CSCL 13M

A particular purpose of the workshop was to identify the research needs in various areas of earthquake engineering and to recommend the most appropriate experimental procedures for the solution of those needs. The types of experimental work considered were: observations and reports of damage or structural behavior during earthquakes; tests using medium and large size shaking tables; static and dynamic laboratory tests on components, full size or scaled structures, soil samples, etc.; use of high explosive or nuclear detonations, and field tests or static and dynamic tests of actual structures. GRA

N75-25397# Interagency Task Force on Inadvertent Modification of the Stratosphere, Washington, D.C.
TRANSCRIPT OF PROCEEDINGS, INTERAGENCY TASK FORCE ON INADVERENT MODIFICATION OF THE STRATOSPHERE
27 Feb. 1975 223 p
(PB-240122/2; IMOS-22775) Avail: NTIS HC $7.25 CSCL 04A

The effects of fluorocarbons and other inert gaseous compounds used as the chief propellant in aerosol products and as coolants and foaming agents are investigated in terms of man induced changes in the stratosphere. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N75-25398 British Library Lending Div., Boston Spa (England).
DISTRIBUTION AND CHEMICAL ENRICHMENT OF PRECIPITATION IN A SOUTHERN NORWAY FOREST STAND, JULY - DECEMBER 1972
Kristian Bjor, Richard Horntvedt, and Einar Joranger 16 Dec. 1974 38 p refs Transl. into ENGLISH from Norwegian report
(BLL-CE-TRANS-6579-(9022.09); RR-1) Avail: British Library Lending Div., Boston Spa, Engl.: 4 BLL photocopy coupons

The quantity and distribution of the rainfall under spruce (Picea abies (L.) Karst.), pine (Pinus sylvestris L.) and birch (Betula verrucosa Ehrh.) were plotted. The chemical composition of the rainfall as it passes through the tree crown canopy in the forest stands of different types was investigated. Author

N75-25399# Finnish Meteorological Inst., Helsinki.
LIGHTNING FLASH COUNTER MEASUREMENTS IN FINLAND DURING 1974
Leila Laitinen 1975 20 p refs In FINNISH
(Rept-54) Avail: NTIS HC $3.25

Results obtained from various lightning flash counters in Finland are presented. J.M.S.

N75-25400*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN OPERATIONAL SATELLITE SCATTEROMETER FOR WIND VECTOR MEASUREMENTS OVER THE OCEAN
W. L. Grantham, E. M. Bracalente, W. L. Jones, J. H. Schrader, L. C. Schroeder, and J. L. Mitchell (LTV Aerospace Corp., Hampton, Va.) 18 Mar. 1975 169 p refs
(NASA-TM-X-72672) Avail: NTIS HC $6.25 CSCL 14B

Performance requirements and design characteristics of a microwave scatterometer wind sensor for measuring surface winds over the oceans on a global basis are described. Scatterometer specifications are developed from user requirements of wind vector measurement range and accuracy, swath width, resolution cell size and measurement grid spacing. A detailed analysis is performed for a baseline fan-beam scatterometer design, and its performance capabilities for meeting the SeaSat-A user requirements. Various modes of operation are discussed which will allow the resolution of questions concerning the effects of sea state on the scatterometer wind sensing ability and to verify design boundaries of the instrument. Author

N75-25401# Finnish Meteorological Inst., Helsinki.
CLIMATOLOGICAL DATA, 1973
1974 115 p refs In FINNISH and in ENGLISH
Avail: NTIS HC $5.25

Daily meteorological observations from synoptic and airport weather stations are presented along with monthly and annual summaries from 153 stations. The data were processed on a Datasaab D22. The climatic data include: day of month, air temperatures, daily mean temperatures, maximum and minimum temperatures for the day, recorded precipitation, depth of snow, air pressure, relative humidity, and wind direction and speed. J.M.S.

N75-25402# Finnish Meteorological Inst., Helsinki.
PRECIPITATION AND SNOW COVER DATA, 1972
1974 110 p refs In FINNISH and in ENGLISH
Avail: NTIS HC $5.25

Daily precipitation recordings and reports on the nature of the precipitation from 108 weather stations are presented in tabular form. The tabulated data include monthly and annual precipitation, maximum diurnal precipitation, the date of the latter, the number of days with rain, and the number of days with snow or sleet. Author

N75-25403*# National Weather Service, Camp Springs, Md.
SYNOPTIC ANALYSES, 5-, 2-, AND 0.4-MILLIBAR SURFACES FOR JANUARY 1972 THROUGH JUNE 1973
Washington NASA 1975 208 p refs
(NASA Order P-55946-G)
(NASA-SP-3091) Avail: NTIS HC $7.25

Data from meteorological rocketsonde and satellite radiance measurements were employed to analyze a series of high-altitude synoptic charts. The methods employed for processing the various types of data and the analysis procedure are described. Broad-scale analyses for the Northern Hemisphere 5-, 2-, and 0.4-mb surfaces are presented for each week from September through April and for each month from May through August during the period January 1972 through June 1973. A brief discussion of the height and temperature fields is also given. Circulation and temperature changes associated with a minor stratospheric warming in January and February 1972 and a major stratospheric warming in January and February 1973 are among the discussion items. Author

N75-25404# Joint Publications Research Service, Arlington, Va.
PHYSICAL-STATISTICAL METHOD OF INDICATING HAIL CLOUDS
K. Stanchev, R. Petrov, and P. Boyev 5 Jun. 1975 9 p refs Transl. into ENGLISH from Khidrol. Meteorol. (Sofia), v. 24, no. 2, 1975 p 10-17
(JPRS-64924) Avail: NTIS HC $3.25

A physical-statistical method of indicating convective hail clouds based on the Bayes theorem for the total probability of independent events is analyzed. The provisional probability of hail is calculated by the measured values of independent parameters for hail and rain. The optimal wavelength for meteorological radar is also discussed. L.B.

N75-25405*# Kanner (Leo) Associates, Redwood City, Calif.
METHODS OF INVESTIGATING HUMIDITY AT HIGH ALTITUDES
S. D. Andreyev Washington NASA Jun. 1975 21 p refs Transl. into ENGLISH from Probl. fiz. Atmosfery (USSR), no. 6, 1968 p 44-58
(Contract NASw-2481)
(NASA-TT-F-16408) Avail: NTIS HC $3.25 CSCL 04B

Comparison of the relative merits and disadvantages of different types of equipment and procedures for measuring atmospheric humidity in order to define reasons for the current diversity in available experimental data were studied. Errors and limitations are discussed for (1) hair hygrometers; (2) sample testing; (3) condensation hygrometers; (4) methods based on measurements of the heat exchange coefficient of a heated filament; (5) measurement of UV absorption near the Lyman-alpha line; (6) measurement of atmospheric absorption in vibrational - rotational and rotational bands of water vapor; (7) RF mass spectrometers; (8) and refractometric measurements. Author

N75-25406*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A SIMPLE METHOD TO INCORPORATE WATER VAPOR ABSORPTION IN THE 15 MICRONS REMOTE TEMPERATURE SOUNDING
G. Dallu (Computer Sci. Corp.), C. Prabhakara, and B. J. Conhath May 1975 25 p Submitted for publication
(NASA-TM-X-70910; X-910-75-129) Avail: NTIS HC $3.25 CSCL 04B

The water vapor absorption in the 15 micron CO2 band, which can affect the remotely sensed temperatures near the surface, are estimated with the help of an empirical method. This method is based on the differential absorption properties of the water vapor in the 11-13 micron window region and does not require a detailed knowledge of the water vapor profile. With this approach Nimbus 4 IRIS radiance measurements are inverted to obtain temperature profiles. These calculated profiles agree with radiosonde data within about 2 C. Author

N75-25407*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A SATELLITE TECHNIQUE FOR QUANTITATIVELY MAPPING RAINFALL RATES OVER THE OCEANS
T. T. Wilheit, M. S. V. Roa (Environ. Res. and Technol., Inc., Concord, Mass.), T. C. Chang, E. B. Rodgers, and J. S. Theon Mar. 1975 30 p refs Submitted for publication
(NASA-TM-X-70904; X-911-75-72) Avail: NTIS HC $3.75 CSCL 04B

A theoretical model for calculating microwave radiative transfer in raining atmospheres is developed. These calculations are compared with microwave brightness temperatures at a wavelength of 1.55 cm measured on the Nimbus-5 satellite and rain rates derived from WSR-57 meteorological radar measurements. A specially designed ground based verification experiment was also performed wherein upward viewing microwave brightness temperature measurements at wavelengths of 1.55 cm and 0.81 cm were compared with directly measured rain rates. Author

N75-25408# World Meteorological Organization, Geneva (Switzerland).
WEATHER MODIFICATION
1974 564 p refs Proc. of WMO/Intern. Assoc. of Meteorol. and Atmospheric Phys. Sci. Conf., Tashkent, 1-7 Oct. 1973
(WMO-399; ISBN-92-63-10399-2) Avail: NTIS HC $13.00; WMO, Geneva

Papers are presented in the following areas: fog dispersal; rain enhancement; snow enhancement; hail suppression; other aspects of weather modification; technical and operational aspects of weather modification; physical, statistical, and economic evaluations of weather modification; and ice nuclei technology. For individual titles, see N75-25409 through N75-25466.

N75-25409 Etablissement d'Etudes et de Recherches Meteorologiques, Paris (France).
FOG DISPERSAL: PHYSICAL AND TECHNOLOGICAL ASPECTS
L. Facy *In* WMO Weather Modification 1974 p 3-11 (For availability see N75-25408 16-47)
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Fog dispersal techniques in use at various airports are summarized together with techniques at the laboratory stage. The two main methods of dispersal are discussed for warm and cold fogs. Techniques for warm fog dispersal include use of heat to vaporize water droplets, seeding, and hygroscopic aerosols. The two main techniques used in supercooled fog dispersal are homogeneous and heterogeneous nucleation. ESRO

N75-25410 Ukrainian Scientific Hydrometeorological Inst. (USSR).
ON A METHOD OF FOG MODIFICATION BY PASSIVATION OF CONDENSATION NUCLEI
R. A. Bakhanova and A. V. Silayev *In* WMO Weather Modification 1974 p 13-17 refs (For availability see N75-25408 16-47)
Copyright.

The effect of cetyl alcohol adsorption layers was studied for the early stages of condensation growth of hygroscopic nuclei (ammonium chloride). The modification of the nucleus surface by cetyl alcohol was carried out by the adsorption of its molecules from the gas phase. The stream method was used to observe nuclei growth. The method is similar to earlier techniques but control of relative humidity, and the saturation of the humid air flow with cetyl alcohol vapor were added. The method permits measurement of the nucleus growth on a time lapse of 0.4 to 14 secs. ESRO

N75-25411 Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
DESIGN OF A MODERN THERMAL FOG DISSIPATION SYSTEM FOR AIRPORTS

Bernard A. Silverman and Alan I. Weinstein *In* WMO Weather Modification 1974 p 19-28 refs (For availability see N75-25408 16-47)
Copyright.

The historical background to using heat to dissipate warm fog from runways is summarized. The U.S. Air Force program of fog dispersal methods and thermal fog dissipation system plans are reviewed. Components of the system (burners, fuel storage area, fuel distribution system, and control system) are described. Costs of installing and maintaining the system are estimated. ESRO

N75-25412 Academy of Sciences (USSR), Moscow. Inst. of Physical Chemistry.
PROBLEMS OF RADIATION FOG PREVENTION
B. V. Derjaguin, I. N. Grigorenko, V. A. Ershov, I. A. Zolotarev, Y. S. Kurgin, L. F. Leonov, B. A. Malikov, P. S. Prokhorov, V. A. Fedoseev, E. I. Shaglij et al *In* WMO Weather Modification 1974 p 29-33 Prepared jointly with Odessa State Univ. (For availability see N75-25408 16-47)
Copyright.

The critical supersaturation of water vapor was calculated by jointly solving an equation for the adsorption kinetics of cetyl vapor on the surface of a growing water drop. The most efficient method of saturating air with alcohol vapor is described, and attempts to use the process in dispersing fog are discussed. ESRO

N75-25413 Central Aerological Observatory, Dolgoprudnyi (USSR).
SOME DATA ABOUT THE MECHANISM OF THE ARTIFICIAL DISSIPATION OF SUPERCOOLED FOG
L. I. Krasnovskaya, T. I. Shevaldina, and A. N. Hizhnjak *In* WMO Weather Modification 1974 p 35-40 refs (For availability see N75-25408 16-47)
Copyright.

Possibility of using propane is discussed for the artificial dissipation of fog at temperatures considerably higher than the threshold temperatures at which cooling reagents and ice-forming aerosols are active. A method for studying the dissipation process resulting from the use of particular reagents is described together with the equipment. Quantities of active nuclei formed per gram of reagent introduced with liquid carbon dioxide, propane, and Freon-12 were compared. ESRO

N75-25414 Commonwealth Scientific and Industrial Research Organization, Sydney (Australia). Div. of Cloud Physics.
RAIN ENHANCEMENT: A REVIEW
J. Warner *In* WMO Weather Modification 1974 p 43-50 refs (For availability see N75-25408 16-47)
Copyright.

The value of statistical evaluation of cloud seeding experiments to induce rainfall is stressed. The features and conditions making for acceptable or non-acceptable experiments are isolated and discussed. ESRO

N75-25415 Ukrainian Scientific Hydrometeorological Inst. (USSR).
RESULTS OF SEEDING CUMULONIMBUS CLOUDS AIMED AT THE MODIFICATION OF PRECIPITATION IN THE STEPPE PART OF THE UKRAINE
F. Y. Voit, E. E. Kornienko, I. A. Kurejko, A. I. Furman, and S. B. Husid *In* WMO Weather Modification 1974 p 51-54 refs (For availability see N75-25408 16-47)
Copyright.

Cumulonimbus cloud seeding experiments to induce rainfall in the Ukraine steppes are described. Results of the seeding experiments are given and discussed. ESRO

N75-25416 Brest Univ. (France).
SALT DRIZZLES EXTRACTED FROM UNSATURATED AIR LAYERS BY SEEDING WITH HYGROSCOPIC NUCLEI
R. Serpolay and M. Andro *In* WMO Weather Modification 1974 p 55-61 refs Sponsored in part by Direc. des Rech. et Moyens d'Essais, Paris Airport, and Air France (For availability see N75-25408 16-47)
Copyright.

By dispersing a powder of sodium chloride, it is possible to induce locally a drizzle in fog layers. In order to increase the number of data resulting from field experiments, seedings were carried out into uncloudy air layers with R.H. of between 100% and 75% - the latter value corresponding to the critical R.H. for sodium chloride. The experimental conditions, data, and measurements are described, and the experimental results discussed. ESRO

N75-25417 Brest Univ. (France).
RAPID INDUCEMENT OF PRECIPITATION BY SEEDING STRATIFIED AIR LAYERS
R. Serpolay and M. Andro *In* WMO Weather Modification 1974 p 63-67 refs (For availability see N75-25408 16-47)
Copyright.

Prevailing conditions for a rapid formation of precipitation in supercooled fogs are listed, and an attempt to demonstrate the collision-coalescence when seeding supercooled fog and ice crystals is made. Methods of explaining the phenomenon of precipitation rapidly released by high concentration of active nuclei are explored. ESRO

N75-25418 Aerological Observatory, Tokyo (Japan).
ON THE EFFICIENT SIZE AND CONCENTRATION OF SPRAY DROPS FOR STIMULATING WARM CLOUDS
Yoshihiko Takahashi *In* WMO Weather Modification 1974 p 69-80 refs (For availability see N75-25408 16-47)
Copyright.

An improved theory on the formation of drizzle and its application to seeding warm clouds and water spray are presented. The probability of raindrop collisions is discussed and the critical radius of cloud droplets determined. The time required for the formation of drizzle in a system of drops growth through collisions between drops of equal size is examined. The effects of cloud seeding are considered, and the processes leading to drop growth from cloud to drizzle are also compared. ESRO

N75-25419 South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
NUMERICAL SIMULATION OF CLOUD SEEDING EXPERIMENTS
Harold D. Orville, Fred J. Kopp, and Kenneth G. Hubbard *In* WMO Weather Modification 1974 p 81-88 refs (For availability see N75-25408 16-47)
(Grants NSF GA-24647; NSF GA-36910X)
Copyright.

A two-dimensional time dependent model of cloud development over mountainous terrain was used to simulate ideal cloud seeding experiments. The model is described, and various cloud seeding hypotheses are discussed. Results using the different seeding methods are presented. ESRO

N75-25420 Main Geophysical Observatory, Leningrad (USSR).
THEORETICAL RESEARCH INTO ARTIFICIAL STIMULATION OF PRECIPITATION FOR FIGHTING FOREST FIRES
D. D. Stalevich, T. S. Uchevatkina, and N. S. Shishkin *In* WMO Weather Modification 1974 p 89-94 refs (For availability see N75-25408 16-47)
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The artificial stimulation of rain to extinguish forest fires in the Soviet Union is discussed. The optimal expenditure of seeding agents to produce maximum precipitation is considered, together with the distance at which the cloud should be seeded in order that the precipitation falls directly on the fire. ESRO

N75-25421 Colorado State Univ., Fort Collins.
FEASIBILITY OF MESO- AND SYNOPTIC-SCALE WEATHER MODIFICATION FROM CARBON PARTICLE SEEDING
W. M. Gray and W. M. Frank *In* WMO Weather Modification 1974 p 95-102 refs (For availability see N75-25408 16-47)
Copyright.

Mesoscale weather modification from solar energy interception by small carbon particles acting as an artificial heat source which would produce an upward vertical motion field which would stimulate cumulus convection is discussed. The pertinent facts on carbon black dust as an artificial energy source for mesoscale modification are summarized, and a physical hypothesis of heat source utilization is presented. Seeding and dispersion aspects are discussed, together with economic and pollution considerations. ESRO

N75-25422 Hebrew Univ., Jerusalem (Israel). Dept. of Atmospheric Sciences.
THE ROLE OF SOLID PRECIPITATION ELEMENTS IN NATURAL AND ARTIFICIAL PRODUCTION OF RAIN IN ISRAEL
A. Gagin and I. Steinhorn *In* WMO Weather Modification 1974 p 103-124 refs (For availability see N75-25408 16-47)
Copyright.

Israeli experiments in cloud seeding are briefly summarized, and the plausibility of the statistically significant positive effects obtained is assessed. Computations of the growth of solid precipitation elements in model clouds are made. The physical properties of ice particles are noted and their growth calculated. ESRO

N75-25423 National Oceanic and Atmospheric Administration, Boulder, Colo. Atmospheric Physics and Chemistry Lab.
SNOWFALL ENHANCEMENT
H. Weickmann *In* WMO Weather Modification 1974 p 127-141 refs (For availability see N75-25408 16-47)
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The problem of snowfall enhancement is related to the more general problem of rainmaking. The most important microphysical parameter - the concentration of snow crystals - is examined together with the rate of condensation and cloud thickness. Snowfall enhancement opportunities are discussed, and winter cloud systems with seeding potential are considered. Seeding techniques are described and results of snow enhancement projects are given. ESRO

N75-25424 Ukrainian Scientific Hydrometeorological Inst. (USSR).
THE EXPERIMENTAL SEEDING OF FRONTAL CLOUDS IN WINTER IN ORDER TO INCREASE PRECIPITATION
B. N. Leskov *In* WMO Weather Modification 1974 p 143-147 refs (For availability see N75-25408 16-47)
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Solid carbon dioxide was introduced into frontal cloud layers suitable for seeding during winter with the object of increasing precipitation. An analysis of the results of 77 seeding experiments is presented and discussed. The results show that such treatment of frontal clouds causes substantial transformation characterized by a change of phase state of dry and mixed layers, by an increase in crystal concentrations, and by a rise in temperature. ESRO

N75-25425 Indian Inst. of Tropical Meteorology, Poona.
GROUND-BASED CLOUD SEEDING EXPERIMENT AT DELHI DURING WINTER
R. K. Kapoor, R. N. Chatterjee, K. K. Kanuga, S. K. Paul, and B. V. RamanaMurty *In* WMO Weather Modification 1974 p 149-158 refs (For availability see N75-25408 16-47)
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A series of ground-based experiments in India relating to cold seeding of clouds using silver iodide as a reagent is described and the results obtained so far are presented. The seeding solution and techniques, weather features, seedable days, and analyses are discussed. ESRO

N75-25426 Washington Univ., Seattle. Dept. of Atmospheric Sciences.
THE ARTIFICIAL MODIFICATION OF CLOUDS AND PRECIPITATION IN A MOUNTAINOUS REGION
Peter V. Hobbs and Lawrence F. Radke *In* WMO Weather Modification 1974 p 159-167 refs (For availability see N75-25408 16-47)
(Contract DI-14-06-D-6999; Grant NSF GI-31759)
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The theoretical bases of the Cascade project which investigates the dynamics and microstructure of winter storms over the Cascade Mountains are outlined. A theoretical model was developed to describe the airflow over the Cascades and the growth and fallout of precipitation. Observations and measurements during artificial seeding are emphasized. Conclusions concerning the effectiveness of the technique for modifying the distribution of snowfall across a mountain range are presented. ESRO

N75-25427 State Univ. of New York, Albany. Atmospheric Sciences Research Center.
SEEDING REQUIREMENTS FOR RAPID GLACIATION OR STIMULATION OF A MIXED PHASE CLOUD
James E. Jiusto *In* WMO Weather Modification 1974 p 169-178 refs Sponsored by Dept. of Commerce (For availability see N75-25408 16-47)
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An equation to estimate the number of nuclei necessary to rapidly glaciate a supercooled cloud was developed. Using more complete information on crystal growth rates, the estimates are refined for particular crystal types and for several pressure levels. The calculations and results are given, and some implications for cloud modification are discussed. ESRO

N75-25428 Nevada Univ., Reno. Desert Research Inst.
THE PYRAMID PILOT CLOUD-SEEDING PROJECT
Joseph A. Warburton *In* WMO Weather Modification 1974 p 179-186 (For availability see N75-25408 16-47)
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Concern for the preservation of Lake Pyramid (Nevada) led to the commencement of a weather modification program designed to augment the inflow to the new system supplying the lake. The program and techniques are described for seeding cloud to enhance snowfall. Radar observations of snowstorms and analyses of data leading to seeding decisions are also discussed. ESRO

N75-25429 High Mountain Geophysical Inst., Nalchik (USSR).
HAIL PROCESS INVESTIGATION AND HAIL SUPPRESSION ACTIVITIES IN THE USSR
I. I. Burtsev, I. I. Gaivoronsky (Central Aerological Obs.), and A. I. Kartsivadze (Acad. of Sci. of the Georgian SSR) *In* WMO Weather Modification 1974 p 189-196 (For availability see N75-25408 16-47)
Copyright.

The conditions needed for the formation of hail are summarized and experimental conclusions are put forward in connection with modification problems. The objectives of a program on hail suppression methods are given. ESRO

N75-25430 Centre National de la Recherche Scientifique, Grenoble (France). Lab. of Glaciology.
NATURAL 'HAILCORES' AND THEIR ABILITIES TO ESTIMATE THE EFFICIENCY OF HAIL PREVENTION SYSTEMS
P. Admirat *In* WMO Weather Modification 1974 p 197-206 refs Sponsored by Min. de l'Agr. (For availability see N75-25408 16-47)
Copyright.

The detailed structure of hail precipitation and its evolution from one point to another, for natural storms and for seeded storms, are determined in order to compare the two structures and to deduce the efficiency of hail prevention techniques. The hail measuring instruments are described and the data, calculations, and results presented. A hypothesis as to the origin of hailcores is then formulated. ESRO

N75-25431 National Research Center for Diaster Prevention, Tokyo (Japan).
HAILSTORMS IN JAPAN
Yukio Omoto *In* WMO Weather Modification 1974 p 207-215 refs (For availability see N75-25408 16-47)
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Summaries of recent research results on various aspects of hailstorms in Japan are presented. Using data from weather stations, the distribution of the number of hail-drops in Japan was obtained, and ascribed to two different kinds of hailstorms. The climatology of warm season hailstorms in the Kanto-Koshen district was studied in detail and the distribution noted. Conditions for hailstorm development are discussed with emphasis on storm structure and behavior. ESRO

N75-25432 Central Aerological Observatory, Dolgoprudnyi (USSR).
RESEARCH INTO HAIL-FORMING PROCESSES AND THE

RESULTS OF ANTI-HAIL PROTECTION MEASURES IN MOLDAVIA

I. I. Gaivoronsky, L. A. Dinevitch, and N. M. Zaitchenko *In* WMO Weather Modification 1974 p 217-223 (For availability see N75-25408 16-47)
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The evolution and regeneration of thunder and hail clouds in Moldavia both under natural conditions and when subjected to artificial modification, were investigated. The peculiarities of the temperature and humidity regimes associated with hail formation are examined. The results show that there was a marked reduction in the size of the hail-damaged area in a protected area, while in control areas, during the same period, the level of hail damage remained within the lower limits. ESRO

N75-25433 Transcaucasus Scientific Research Hydrometeorological Inst. (USSR).

ON THE RESULTS OF PRACTICAL PROTECTION OF VALUABLE AGRICULTURAL CROPS FROM HAIL BY THE THRI (ZAKNIGMI) METHOD (THE RESULTS OF FIVE YEARS' WORK, 1969 - 1973)

V. P. Lominadze, I. T. Bartishvili, and S. L. Gudushauri *In* WMO Weather Modification 1974 p 225-230 refs (For availability see N75-25408 16-47)
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A method of active modification of hail processes based upon the simultaneous application of hygroscopic and crystallizing reagents and the change in their general conditions is described. An application of the method to protect agricultural crops over large areas from hail during the five-year period 1969-1973 is discussed. ESRO

N75-25434 Leningrad Hydrometeorological Inst. (USSR).

SIMULATION OF THE NATURAL PROCESS OF HAIL FORMATION AND ITS TRANSFORMATION UNDER THE INFLUENCE OF ARTIFICIAL CRYSTALLIZATION

L. G. Kachurin, N. D. Artemyeva, A. I. Kartsivadze, S. Stoyanov, and M. Tekle *In* WMO Weather Modification 1974 p 231-237 refs (For availability see N75-25408 16-47)
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The natural process of hail formation and its transformation under the influence of crystallizing reagents were analyzed. Equations expressing various stages of the hail forming process are discussed together with the calculation of convection parameters. The injection of crystallizing reagents into clouds, the subsequent growth of hailstones, and the change of radar reflectivity as a result are described. ESRO

N75-25435 Bulgarian Academy of Science, Sofia.

REVIEW OF RECENT WORK ON HAIL SUPPRESSION IN BULGARIA

L. Krastanov and K. Stantchev *In* WMO Weather Modification 1974 p 239-241 (For availability see N75-25408 16-47)
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The background to hail suppression activities in Bulgaria is given and basic difficulties encountered during work are summarized. The types of rocket and reagents used for cloud seeding experiments are briefly described. The effectiveness and cost of the work in hail suppression are assessed. ESRO

N75-25436 National Oceanic and Atmospheric Administration, Miami, Fla. National Hurricane Research Lab.

THE EXPERIMENTAL PROGRAM TO MODIFY HURRICANES

R. Cecil Gentry *In* WMO Weather Modification 1974 p 245-254 refs (For availability see N75-25408 16-47)
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Results of experimental research on hurricane seeding to reduce the destructive force are summarized. An approach to hurricane modification based on obtaining a reduction in wind speed by the reduction in the temperature gradients is proposed and discussed. The pyrotechnics used for the seeding of hurricanes are described together with details of experiment monitoring. The principal damages from hurricanes, attributable to these causes, are also discussed. ESRO

N75-25437 Academy of Sciences (USSR), Moscow. Inst. of Applied Geophysics.

DYNAMIC METHODS OF CONVECTIVE CLOUD MODIFICATION BY MEANS OF ARTIFICIAL VERTICAL JETS

N. I. Vulfson and L. M. Levin *In* WMO Weather Modification 1974 p 255-263 refs (For availability see N75-25408 16-47)
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The use of aircraft turbojet engines to generate ascending vertical jets of heated air with high initial velocity capable of transpiercing stable layers thus preventing natural development of convection clouds is described. The inhibition of cumulus development by descending jets is also discussed and the efficiency of the two methods is compared. ESRO

N75-25438 Main Geophysical Observatory, Leningrad (USSR).

RESULTS OF EXPERIMENTAL AND OPERATIONAL WORK ON COMBATING FOREST FIRES

E. S. Artsybashev, P. A. Gubin, A. I. Sidorov, J. P. Sumin, and N. S. Shishkin *In* WMO Weather Modification 1974 p 265-266 refs (For availability see N75-25408 16-47)
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Experimental work is described on the seeding of clouds to extinguish forest fires in Siberia by means of artificial precipitation. Preliminary results are given. ESRO

N75-25439 Central Aerological Observatory, Dolgoprudnyi (USSR).

CONVECTIVE CLOUD MODIFICATION TO REDUCE THUNDERSTORM ACTIVITY

I. I. Gaivoronsky, L. P. Zatsepina, and B. I. Zimin *In* WMO Weather Modification 1974 p 267-274 refs (For availability see N75-25408 16-47)
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Experiments to reduce thunderstorm activity by regulating convection cloud evolution are described. Lightning frequencies were used to assess seeding results. Laboratory studies into the mechanisms of initiating descending motions are also discussed. ESRO

N75-25440 High Mountain Geophysical Inst., Nalchik (USSR).

ON THE POSSIBILITY OF THUNDERSTORM SUPPRESSION BY CHANGING THE NON-EQUILIBRIUM CRYSTALLIZATION POTENTIALS OF CLOUD WATER

L. G. Kachurin, H. H. Medaliev, and N. I. Karmov *In* WMO Weather Modification 1974 p 275-282 refs (For availability see N75-25408 16-47)
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Thundercloud characteristics and their variation with time are summarized. The electromagnetic radiation discharge from thunderclouds is studied together with the time characteristics of the cloud-radiated pulse parcels in the prestorm and storm stages. The radiation field intensity of convection cloud in different stages of development is discussed. Preliminary experiments on cumulonimbus modification at the prestorm stage shows that it is possible to affect the degree of electrical activity and thus the radiation field. ESRO

N75-25441 Ukrainian Scientific Hydrometeorological Inst. (USSR).

SOME QUESTIONS OF THUNDERSTORM LIGHTNING CONTROL

V. M. Muchnik and V. A. Djachuk *In* WMO Weather Modification 1974 p 283-288 refs (For availability see N75-25408 16-47)
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Theories of electrification mechanisms in thunderstorms and their application are briefly reviewed. Based on the assumption that the thunderstorm is a powerful generator of electricity with a positive feedback process, two possibilities of controlling thunderstorm activity are discussed, the second of which introduces linear discharges in the clouds. To study the collective effect of such discharges the corona discharge was investigated. Conclusions based on an analysis of the results are presented. ESRO

N75-25442 National Oceanic and Atmospheric Administration, Boulder, Colo. Atmospheric Physics and Chemistry Lab.

THE EFFECT OF CHAFF SEEDING ON LIGHTNING AND ELECTRIC FIELDS OF THUNDERSTORMS

H. W. Kasemir *In* WMO Weather Modification 1974 p 289-294 refs (For availability see N75-25408 16-47)

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The problems encountered by chaff seeding thunderstorms are investigated by field experiments planned to study the effect of chaff-seeding on the electric fields and lightning discharges of thunderstorms. Results indicate that the delay of the electric field beneath a thunderstorm is accelerated by a factor of five by chaff seeding. Instrument development, test procedures, and data analysis of the field delay experiment as well as its significance to lightning modification are discussed. ESRO

N75-25443 Institute of Experimental Meteorology (USSR).
THE POSSIBILITY OF USING CHARGED BUBBLES IN CLOUD MODIFICATION
O. A. Volkovitskii and V. V. Smirnov *In* WMO Weather Modification 1974 p 295-300 refs (For availability see N75-25408 16-47)
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The characteristics of the coagulation growth of charged bubbles were investigated to estimate the collection efficiency of cloud droplets by the bubbles. The experimental procedure is outlined. Estimates on the droplet wash-out rate from stratiform cloud were obtained. ESRO

N75-25444 High Mountain Geophysical Inst., Nalchik (USSR).
ON THE POSSIBILITY OF GENERATING DOWNDRAFTS BY INTRODUCING A HIGH CONCENTRATION OF COURSE AEROSOL PARTICLES IN THE ATMOSPHERE
V. G. Khorguani and K. M. Kalov *In* WMO Weather Modification 1974 p 301-308 refs (For availability see N75-25408 16-47)
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An attempt is made to estimate the velocity and mode of descent of a high concentration system of coarse aerosol particles and to evaluate the downward velocity impulse thus generated. Laboratory and field experiments are described and their results analyzed. ESRO

N75-25445 National Oceanic and Atmospheric Administration, Coral Gables, Fla. Experimental Meteorology Lab.
THE 1973 FLORIDA AREA CUMULUS EXPERIMENT
Robert I. Sax, Joanne Simpson, and William L. Woodley *In* WMO Weather Modification 1974 p 309-316 refs (For availability see N75-25408 16-47)
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The background to the 1973 Florida Area Cumulus Experiment is briefly given together with the experimental concept and design for evaluating the effects of dynamic seeding on tropical cumulus clouds. Preliminary results are reported and plans for analysis discussed. ESRO

N75-25446 Central Aerological Observatory, Dolgoprudnyi (USSR).
TECHNICAL DEVICES FOR THE ARTIFICIAL MODIFICATION OF CLOUD AND FOG
I. I. Gaivoronsky, Y. A. Seregin, A. I. Sidorov, and S. A. Silin *In* WMO Weather Modification 1974 p 319-324 (For availability see N75-25408 16-47)
Copyright.

Designs of weather modification devices are described with brief reference to the most important research findings which determine the peculiarities of their design and working principle. The devices include those for cloud and fog seeding by solid carbon dioxide, dust, and aerosols, as well as those using pyrotechnics for dispersing ice-forming reactions by volatilization such as silver and lead iodides. ESRO

N75-25447 South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
ENGINEERING OPERATIONAL ASPECTS OF WEATHER MODIFICATION
A. S. Dennis and R. A. Schleusener *In* WMO Weather Modification 1974 p 325-332 (For availability see N75-25408 16-47)
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Cloud seeding projects involve a three-dimensional matrix of effects sought, conceptional models, and delivery techniques. The three basic techniques of delivering silver iodide crystals to a cloud are broadcast seeding, updraft seeding, and direct injection. The types of generator for silver iodide smokes are described, and the rate of silver iodide consumption and its impact on seeding are discussed. Criteria for success include type of cloud system. Various systems of stratiform and convective clouds are examined in the light of several experiments. The adoption of a weather modification program for South Dakota, and the experience to date are discussed. ESRO

N75-25448 Academy of Science of the Georgian SSR, Tbilisi (USSR). Inst. of Geophysics.
ANTI-HAIL ROCKETS AND SHELLS
N. S. Bibilashvili, I. I. Gaivoronsky, G. G. Godorage, A. I. Kartsivadze, and R. N. Stankov *In* WMO Weather Modification 1974 p 333-341 refs (For availability see N75-25408 16-47)
Copyright.

The requirements for devices for delivering reagents to a given part of a cloud are summarized and the Soviet experiments are discussed. The characteristics and effectiveness of several rockets and artillery shells in hail suppression are described. ESRO

N75-25449 Academy of Science of the Georgian SSR, Tbilisi (USSR). Inst. of Geophysics.
RADAR METHODS AND EQUIPMENT FOR HAIL SUPPRESSION
M. T. Abshaev and A. I. Kartsivadze *In* WMO Weather Modification 1974 p 343-351 refs (For availability see N75-25408 16-47)
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The application of radar to identify and locate hail clouds, determine hail precipitation, and monitor injection efficiency is discussed. Various techniques of hail detection and determination of hail stone size by measuring values of the reflectivity ratio or the radar-echo power difference are described. A high-potential specialized radar developed for hail suppression and storm warning is also described. ESRO

N75-25450 Tel-Aviv Univ. (Israel). Dept. of Environmental Sciences.
THE ACQUISITION OF INFORMATION DURING ATTEMPTS AT WEATHER MODIFICATION
William D. Scott *In* WMO Weather Modification 1974 p 353-362 refs (For availability see N75-25408 16-47)
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The requirements for a scientifically created weather modification project are summarized. The various measurements and samples needed for statistical analyses are considered and the instrumentation required for obtaining adequate results is described. ESRO

N75-25451 National Research Center for Diaster Prevention, Tokyo (Japan).
PRELIMINARY RESULTS OF EXPERIMENTS USING SEEDING ROCKETS WITH COMBUSTIBLE SHELLS
Y. Ozawa and Y. Omoto *In* WMO Weather Modification 1974 p 363-371 (For availability see N75-25408 16-47)
Copyright.

The characteristics and performance of a fiberglass reinforced plastic rocket used for cloud seeding and which burns away completely in the air after seeding are described. Results of cloud seeding experiments using the rocket to suppress hail are discussed. ESRO

N75-25452 Asian Regional Hydrometeorological Inst., Tashkent (USSR).
CONVECTIVE CLOUD STUDY RESULTS APPLIED TO WEATHER MODIFICATION
A. D. Djouraev and V. A. Eltsov *In* WMO Weather Modification 1974 p 373-384 refs (For availability see N75-25408 16-47)
Copyright.

On the basis of X-band radar observations certain cloud characteristics were obtained. Observational data over the period 1969-1972 were analyzed for hail, shower, and nonprecipitating clouds satisfying various conditions. The parameters characterizing the clouds are listed, and hail-cloud occurrence related to different values of the parameters are considered. A probability method developed for hail cloud occurrence is described together with hail cloud modification. ESRO

N75-25453 Bulgarian Academy of Science, Sofia. Hydrological and Meteorological Inst.

ON THE THERMODYNAMIC CRITERIA FOR THE INTENSITY OF CONVECTIVE CLOUD DEVELOPMENT

K. Stantchev, P. Boev, and R. Petrov *In* WMO Weather Modification 1974 p 385-394 refs (For availability see N75-25408 16-47)

Copyright.

An investigation of the relationship between the maximum intensity of precipitation from a convective cloud and the total energy of instability in the appropriate layer of the atmosphere is described. From the thermodynamics of the atmospheric processes equations are built up and analyzed using data from a number of rain gages and weather stations. The influence of wind, moisture content, and seeding on rainfall intensity is discussed. ESRO

N75-25454 Illinois State Water Survey, Urbana. Atmospheric Sciences Section.

A REVIEW OF METHODS TO EVALUATE PRECIPITATION MODIFICATION IN NORTH AMERICA

Stanley A. Changnon, Jr. *In* WMO Weather Modification 1974 p 397-422 refs (For availability see N75-25408 16-47)

(Contract DI-14-06-D-7197; Grants NSF GI-33371; NSF GI-38317; NSF GK-37859)

Copyright.

Data and methods used to verify precipitation (hail, rain and snow) modification in North America are described and evaluated. The modifications reviewed relate to those from both planned attempts and inadvertent urban-industrial modification of precipitation. A history of evaluation techniques is given and the problem of natural variability of precipitation broached. ESRO

N75-25455 Ukrainian Scientific Hydrometeorological Inst. (USSR).

METHODS OF ESTIMATING PHYSICAL AND ECONOMICAL EFFECTIVENESS OF WEATHER MODIFICATION

M. V. Bujkov and E. E. Kornienko *In* WMO Weather Modification 1974 p 423-430 refs (For availability see N75-25408 16-47)

Copyright.

The statistical evaluation of weather modification experiments is reviewed, and methods of the evaluation of experiments on precipitation augmentation in the U.S.S.R. are described. The cost effectiveness of the modification experiments is discussed and the planning of an experiment summarized. A review of the methods for hail suppression projects in the U.S.S.R. is also presented. ESRO

N75-25456 Illinois State Water Survey, Urbana.

ECONOMIC ASPECTS OF PRECIPITATION AUGMENTATION OVER THE GREAT LAKES

Glenn E. Stout *In* WMO Weather Modification 1974 p 431-438 refs (For availability see N75-25408 16-47)

Copyright.

The resources of the Great Lakes region are described considering its natural and economic factors. The hydrologic response to a precipitation increase over the Great Lakes is examined along with the aspects and benefits of a water augmentation program over the region. ESRO

N75-25457 Colorado State Univ., Fort Collins.

AN EVALUATION OF EXTENDED AREA EFFECTS FROM ATTEMPTS TO MODIFY LOCAL CLOUDS AND CLOUD SYSTEMS

G. W. Brier, L. O. Grant, and P. W. Mielke, Jr. *In* WMO Weather Modification 1974 p 439-447 refs (For availability see N75-25408 16-47)

(Contract NCAR 32-72; Grant NSF GI-31460)

Copyright.

Research in progress to investigate the reality and processes of down wind effects from cloud seeding activities is described. Two approaches are discussed: statistical analyses carried out to determine the strength of the evidence for the existence of extended area effects; and physical mechanisms studied through the development and testing of physical models description of the processes which may be involved. ESRO

N75-25458 California Univ., Berkeley. Statistical Lab.

RAIN STIMULATION EXPERIMENTS: DESIGN AND EVALUATION

Jerzy Neyman and Elizabeth L. Scott *In* WMO Weather Modification 1974 p 449-457 refs (For availability see N75-25408 16-47)

(Contract N00014-69-A-0200-1060)

Copyright.

The necessity of randomizing cloud seeding experiments to obtain reliable data is discussed. Hypothetical mechanisms of post-cloud-seeding phenomena are described and the events following cloud seeding in the mechanisms are summarized. The multidimensional character of rain stimulation experiments is noted. ESRO

N75-25459 Institute of Experimental Meteorology (USSR).

ON PHYSICAL AND ECONOMIC EFFECTIVENESS OF HAIL-SUPPRESSION PROJECTS

L. P. Poluektova and V. V. Tsykunov *In* WMO Weather Modification 1974 p 459-464 refs (For availability see N75-25408 16-47)

Copyright.

The after effects of hail suppression activities are examined from two points of view: the physical effect of hail suppression irrespective of the expenses and crops protected; and the economic effect of hail suppression projects. A brief account of the main achievements in the field of hail suppression is given, and the accuracy of physical and economic efficiency estimates are analyzed. ESRO

N75-25460 Academy of Science of the Georgian SSR, Tbilisi (USSR). Inst. of Geophysics.

RADAR CHARACTERISTICS OF CUMULONIMBUS CLOUDS DURING THEIR NATURAL DEVELOPMENT AND ARTIFICIAL SEEDING

A. I. Kartsivadze and T. G. Salukvadze *In* WMO Weather Modification 1974 p 463-472 refs (For availability see N75-25408 16-47)

Copyright.

An attempt is made on the basis of several years of radar measurements to make some physico-statistical evaluations of the results for seeding hail clouds in the Alazani valley using rockets and crystallizing reagents. The parameters used to characterize the degree of hail danger from clouds are listed together with their correlation coefficient and standard errors. The average values of the parameters of clouds are compared after normalization of their values at the time of seeding. ESRO

N75-25461 Iowa State Univ. of Science and Technology, Ames.

ON THE CHARACTERISTICS OF SINGLE-CELL SHOWERS

Harry C. Vaughan and Kenneth L. Rancourt *In* WMO Weather Modification 1974 p 473-482 refs (For availability see N75-25408 16-47)

Copyright.

An investigation is described which attempts to answer questions regarding availability of precipitable water, the efficiency of precipitation in convection clouds, and to promote a better understanding of natural precipitation processes. Overall objectives are summarized, and the experiment facility and procedure outlined. Results are discussed. ESRO

N75-25462 Laboratoire de Meteorologie Dynamique, Paris (France).

PREPARATION AND PROPERTIES OF 'PURE' SILVER IODIDE AEROSOL

M. M. Poc and M. Roulleau *In* WMO Weather Modification 1974 p 485-498 refs (For availability see N75-25408 16-47)

Copyright.

The experimental preparation technique and properties (number concentration of solid particles, mass concentration, and particle size) are described for silver aerosol, iodide, and silver iodide aerosols. The ice forming ability of the silver iodide aerosol at various temperatures is discussed. The results of size distribution and freezing activity analyses show reasonable agreement with theoretical results. ESRO

N75-25463 National Oceanic and Atmospheric Administration, Boulder, Colo. Atmospheric Physics and Chemistry Lab.

AN ICE NUCLEI CONCENTRATION BENCHMARK NETWORK
Paul A. Allee *In* WMO Weather Modification 1974 p 499-506 refs (For availability see N75-25408 16-47)
Copyright.

An ice nuclei concentration benchmark network established in the western United States is described. The purpose of the network is to determine the climatological mean and variation for the ice nuclei concentration throughout the area. The instrumentation of the network is reviewed and the results of an analysis of the data obtained is discussed. ESRO

N75-25464 Michigan Univ., Ann Arbor.
REMOVAL OF PYROTECHNIC GENERATED TRACER PLACED BY AIRCRAFT IN A CONVECTIVE UPDRAFT
A. Nelson Dingle *In* WMO Weather Modification 1974 p 507-520 refs (For availability see N75-25408 16-47)
Copyright.

An experiment is described which was designed to observe the behavior of a convection storm in terms of its redistribution of a fine particle tracer placed in its updraft by means of an aircraft using pyrotechnic flares in a definite pattern. By analogy with the silver iodide cloud seeding procedure using pyrotechnic flares to modify convection storms the results are interpreted in terms of their relevance to this weather modification technique. ESRO

N75-25465 Denver Research Inst., Colo.
ICE NUCLEI GENERATOR TECHNOLOGY
N. Fukuta *In* WMO Weather Modification 1974 p 521-529 refs (For availability see N75-25408 16-47)
Copyright.

Problems related to ice nuclei operation techniques are discussed together with their characteristics and usage within the reacting cloud system. The features of nuclei smokes generated and the activation during the seeding generation are described, and the activation mechanism of ice nuclei is considered. The role of ice nuclei in cloud seeding is also discussed. ESRO

N75-25466 Army Cold Regions Research and Engineering Lab., Hanover, N.H.
CLOUD GLACIATION BY LIQUEFIED PROPANE SPRAY
James R. Hicks and Gabor Vali (Wyoming Univ., Laramie) *In* WMO Weather Modification 1974 p 531-538 refs (For availability see N75-25408 16-47)
(Contract DI-14-06-D-6801)
Copyright.

An experiment to determine the ice crystal production efficiency of propane spray cloud seeding under various laboratory and field conditions is described. The techniques, instrumentation, ice crystal collection, and evaluation are reviewed and the results discussed. ESRO

N75-25467# Clarkson Coll. of Technology, Potsdam, N.Y.
STUDIES OF COLLOIDAL PARTICLES; SCAVENGING OF AEROSOL PARTICLES BY A FALLING MACROSCOPIC PARTICLE Final Report, 1 May 1968 - 30 Apr. 1974
M. Kerker 30 Apr. 1974 15 p refs
(Contract AT(11-1)-3257)
(COO-3257-8) Avail: NTIS HC $3.25

Collection efficiencies of falling water drops ranging from 0.094 to 0.254 cm in radius for silver chloride aerosol particles in nitrogen ranging from 0.15 to 0.6 microns in radius were measured. The drops accelerated for distances ranging from 30 to 515 cm prior to entrance into the scavenging chamber. Results were extrapolated to terminal velocity. The results for the slower moving drops (30 cm acceleration distance) agreed roughly with the predictions of a theory based upon collection by Brownian diffusion. Near terminal velocity, Brownian diffusion theory did not account for the results. For each value of particle radius alpha, the collection efficiency was a sharply increasing function of the impaction parameter P. Calculations of washout coefficient indicated that the half-life of 0.1 microns aerosol particles is of the order of one day for moderate rainfall rates. This result is strongly dependent upon the particular raindrop size distribution. Author (NSA)

N75-25468# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Jun. 1974 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, JUIN 1974]
Jun. 1974 15 p In FRENCH and DUTCH
Avail: NTIS HC $3.25

Meteorological parameters observed at different Belgian weather stations during June 1974 are given. ESRO

N75-25469# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Nov. 1973 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, NOVEMBRE 1973]
Nov. 1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in November 1973 are given. ESRO

N75-25470# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Dec. 1973 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, DECEMBRE 1973]
Dec. 1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in December 1973 are given. ESRO

N75-25471# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Jan. 1975 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, JANVIER 1975]
Jan. 1975 16 p In FRENCH and DUTCH
Avail: NTIS HC $3.25

Meteorological parameters observed at different Belgian weather stations during January 1975 are given. ESRO

N75-25472# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Feb. 1974 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, FEVRIER 1974]
Feb. 1974 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in February 1974 are given. ESRO

N75-25473# Army Electronics Command, Fort Monmouth, N.J.
DETERMINING GEOSTROPHIC WINDS USING A SATELLITE-BORNE INFRARED RADIOMETER
George D. Alexander Feb. 1975 11 p refs
(DA Proj. 1T1-62111-AH-72A)
(AD-A008022; ECOM-5556) Avail: NTIS CSCL 04/2

Several computational techniques for obtaining the geostrophic wind field from satellite-borne infrared radiometer data are investigated. Also discussed are the limitations of approximating the actual wind by this satellite-retrieved geostrophic wind. GRA

N75-25474# McGill Univ., Montreal (Quebec). Faculty of Graduate Studies and Research.
MARITIME MICROCLIMATOLOGY: THE RADIATION BALANCE OF EAST-FACING SLOPES IN BARBADOS Final Report
Benjamin J. Garnier Mar. 1975 68 p refs
(Contract N00014-73-C-0194; NR Proj. 388-112)
(AD-A008576) Avail: NTIS CSCL 04/2

A field program of ground observations and remote sensing was undertaken in Barbados during July, 1973. The program concentrated on observations of elements of the radiation balance of east-facing slopes. The data obtained showed that the surface temperatures of east-facing slopes in Barbados are higher than elsewhere in the morning and as high as elsewhere during the rest of the day. This feature appears to be related to the absorbed global radiation on east-facing slopes which is higher than elsewhere at all times owing to the relatively low albedo (0.13) here as compared with the rest of the island (0.17). Surface geometry also helps to break up early morning cloud on the east to facilitate surface heating from the morning sun. GRA

N75-25475# Environmental Prediction Research Facility (Navy), Monterey, Calif.
PRELIMINARY INVESTIGATION OF THE MONTHLY AND SEASONAL VARIATION OF TOTAL MASS OF THE ATMOSPHERE OF THE NORTHERN HEMISPHERE AND ITS POSSIBLE USE AS A PARTIAL MEASURE OF WATER VAPOR CONTENT CHANGE OF THE ATMOSPHERE
W. Rudloff, T. Laevastu, J. Harding, S. Larson, and G. P. Britton Jan. 1975 19 p refs
(WP52551713)
(AD-A008346; ENVPREDRSCHF-Tech-Paper-1-75) Avail: NTIS CSCL 04/2

It has been found possible to determine, partially, the monthly and seasonal variations of water vapor content changes in the atmosphere of the Northern Hemisphere by the use of monthly mean surface pressure. As an important sideline of this investigation, it was found that the monthly mean surface pressure anomalies over low latitude oceanic regions indicate the anomalies in uptake of water vapor (evaporation) and in its distribution, from which the transport of water vapor to higher latitudes and continents can be estimated. The distribution of these anomalies on weekly and biweekly time scales is expected to become a useful tool in medium-range weather forecasting. GRA

N75-25476# Meteorology Research, Inc., Altadena, Calif.
THE DEVELOPMENT OF AN AIRBORNE WATER SAMPLER Final Scientific Report, Apr. 1973 - Nov. 1974
Richard G. Hooper 22 Nov. 1974 55 p
(Contract F19628-73-C-0216; AF Proj. 8620)
(AD-A008041; MRI-74-FR-1278; AFCRL-TR-74-0600) Avail: NTIS CSCL 04/1

The MRI Total Liquid Water Content Instrument is an aircraft mounted sampler for real-time mass measurements of ice and water drops in the atmosphere. The sample is collected and suspended in a silicone carrier for transport to a detector cell. The cell is an annular-tube electric capacitor in an oscillator circuit. The frequency of the oscillator decreases as the water fraction increases in the silicone carrier flowing through the cell. The high volume sampling rate, typically 100 CFM at 130 mph, assures a representative sample. Limited flight tests indicate successful operation in rain. GRA

N75-25477# Kaysam Corp. of America, Paterson, N.J.
PRODUCTION ENGINEERING MEASURE FOR MANUFACTURE OF METEOROLOGICAL BALLOONS, TYPE ML-566 (XE3)/AM Quarterly Progress Report, 1 Nov. 1974 - 31 Jan. 1975
John Kantor Feb. 1975 31 p
(Contract DAAB07-74-C-0329; DA Proj. 2749470)
(AD-A008443; QPR-3) Avail: NTIS CSCL 04/2

The object of this Contract is to establish the capability of producing ML-566(XE3)/AM meteorological balloons on a pilot-line basis. GRA

N75-25478# Army Foreign Science and Technology Center, Charlottesville, Va.
DUST STORMS IN THE UKRAINE
V. N. Babichenko 20 May 1974 17 p refs Transl. into ENGLISH from Nauchn.-Issled. Tr., Gidromateorologicheskii Inst. (Kiev), no. 52, 1965 p 45-63
(AD-A008263; FSTC-HT-23-0406-74) Avail: NTIS CSCL 04/2

A study was made of dust storms which have taken place during the past years in the Ukraine. The number of days in the year when these storms occur, and their intensity and duration, varies considerably. The main means for combating them is to carry out extensive afforestation and maintaining the soil in a lumpy condition. GRA

N75-25479# Naval Research Lab., Washington, D.C.
ANALYSIS OF MARINE AEROSOLS BY COMBINED SCANNING ELECTRON MICROSCOPY AND X-RAY ANALYSIS Interim Report
William H. Cullen, Peter E. Wilkniss, and David J. Bressan Mar. 1975 16 p
(NRL Proj. F01-03)
(AD-A008547; NRL-MR-3017) Avail: NTIS CSCL 04/1

Scanning electron micrographs of several types of marine aerosols (airborne particulates) are shown, and explanations of the sampling methods are given in this article. These aerosols were collected at altitudes from 600 ft (0.2 km) to 24,000 ft (7.3 km) during airplane flights, and near the ocean-air interface during ship cruises. Some preliminary results of energy dispersive X-ray analysis of the various types of particles are given. The advantages of these methods, together with some other possible applications, are outlined. GRA

N75-25480# Radio Corp. of America, Cape Kennedy, Fla.
A PROPOSAL FOR BALLOON-BORNE METEOROLOGICAL SENSORS
Toxey A. Hall 29 Jan. 1974 44 p refs
(Contract F08606-74-C-0025)
(AD-A008285; RCA/TELTA-TR-74-049; AFETR-TR-75-17) Avail: NTIS CSCL 04/2

A system for measuring meteorological parameters at incremental altitudes is described in the report. A balloon is launched from a self-contained support system and instrument packages are attached to the tether at the desired intervals. Each package contains an anemometer (with directional capability), a pressure transducer, dry and wet bulb temperature transducers (or hygrometer). Data from these sensors is transmitted via VHF radio to a receiving station at the tether point where it can be displayed and recorded. A single-vehicle ground support concept is also included. GRA

N75-25481# Environmental Prediction Research Facility (Navy), Monterey, Calif.
A MARITIME BOUNDARY LAYER MODEL FOR THE PREDICTION OF FOG
Edward H. Barker Mar. 1975 54 p refs
(WF52551)
(AD-A008158; ENVPREDRSCHF-tech-paper-4-75) Avail: NTIS CSCL 04/2

A two-dimensional boundary layer model is described. This model is designed to predict and study the effects of meteorological changes on the formation and dissipation of fog and stratus. Radiational heat loss along with the transport of static energy, moisture and momentum are treated in the model. Cloud droplet distributions are parameterized using a gamma distribution from which radiative properties and droplet fall velocities are computed. Turbulent exchange coefficients are calculated using the Monin-Obukhov theory of similitude which accounts for variations in atmospheric stability. Several experiments are presented which demonstrate the effects of various meteorological parameters on the formation and duration of stratus and fog. Energy budget analyses show the importance of each of the physical processes being modeled. GRA

N75-25482# Naval Weapons Center Corona Labs., Calif.
CLIMATOLOGICAL SUMMARIES FOR 1946 THROUGH 1973. TEMPERATURES, RELATIVE HUMIDITY, PRECIPITATION, WINDS
Jan. 1974 19 p
(AD-A008567) Avail: NTIS CSCL 04/2

The report contains tables of temperatures, humidity, precipitation, and wind data averaged for 1946 through 1973, which were taken at the U.S. Naval Weapons Center at China Lake, California. GRA

N75-25483# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 16102 LITTLE JOHN MISSILE NO. 3121, ROUND NO. 719 RM (26 FEBRUARY 1975) Meteorological Data Report
Feb. 1975 14 p
(DA Proj. 1T6-65702-D-127)
(AD-A008019; DR-886) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 16102 Little John, Missile Number 3121, Round Number 719 RM, are presented in tabular form. GRA

N75-25484# Hawaii Inst. of Geophysics, Honolulu.
THE TRADE WIND FIELD OVER THE PACIFIC OCEAN. PART 1: THE MEAN FIELD AND THE MEAN ANNUAL VARIATION
Klaus Wyrtki and Gary Meyers Jan. 1975 71 p refs

(Contract N00014-67-A-0387-0017)
(AD-A008579; HIG-75-1-Pt-1) Avail: NTIS CSCL 04/2

The trade wind field over the Pacific Ocean between 30N and 30S has been studied on the basis of five million wind observations made by ships. Data were averaged for areas of 2 degrees latitude and 10 degrees longitude to resolve northsouth gradients in the wind field adequately. Mean monthly maps of the wind vector and of the wind stress vector were produced and the development of the trade wind field throughout the year is discussed. Either trade wind system is largest and strongest during the winter of the respective hemisphere. It is shown that the area covered by the northeast trades is smaller than the area covered by the southeast trades, but the northeast trades have a stronger mean wind stress and a larger seasonal variation both in area and mean stress. Bimonthly mean maps of the divergence of the wind and of the wind stress curl are also produced. The wind divergence shows clear relations to cloud cover; the maps of wind stress curl show considerable detail and more structure and seasonal variation than expected. GRA

N75-25485# Environmental Research and Technology, Inc., Lexington, Mass.
STUDIES OF MICROWAVE REMOTE SENSING OF ATMOSPHERIC PARAMETERS Final Report, Mar. 1973 - Jun. 1974
Norman E. Gaut, Mary Grace Fowler, Ronald G. Isaacs, David T. Chang, and Edward C. Reifenstein, III Aug. 1974 73 p refs
(Contract F19628-73-C-0195; AF Proj. 8682)
(AD-A008042; ERT-P-512; AFCRL-TR-75-0007) Avail: NTIS CSCL 04/2

The report addresses itself to two main topics of research and analysis: the effects of clouds and hydrometeors on temperature profiling, and the possibility of obtaining cloud information from microwave remote sensing. Other topic areas covered include: Implementation of the Gross-Reber line-shape model for the oxygen absorption coefficients; Extension of analysis of temperature inversion accuracies to the 118 GHz line; Development of an approximate model for the analysis of the effects of precipitation; and Analysis of the application of the 183 GHz line shape for atmospheric probing. GRA

N75-25486# Johns Hopkins Univ., Baltimore, Md. Dept. of Mechanics and Materials Science.
TURBULENCE RESEARCH Final Report, 11 Jan. 1965 - 30 Sep. 1974
Leslie S. G. Kovasznay 28 Feb. 1975 13 p refs
(Contract DA-31-124-ARO(D)-313)
(AD-A008090; ARO-5413-11-E) Avail: NTIS CSCL 20/4

Turbulent flows were studied especially those aspects that are dominated by the intrinsic nonlinearity of the governing equations. Theories were developed first for the calculation on quasi-parallel shear flows later for coherent turbulent puffs. Measurement techniques were developed for conditional sampling and averaging as well as for detection of large scale coherent motion. By using these above techniques the structure of shear flows was clarified. In order to study coherent structures a special flow termed turbulent puff was devised and its properties were determined and compared with the above mentioned theory. GRA

N75-25487# Analytics, Inc., Willow Grove, Pa.
DESIGN CRITERIA FOR A REFRACTIVE INDEX/WIND SENSING METEOROLOGICAL DROPSONDE
Melvin I. Strieb 22 Oct. 1974 105 p refs
(Contract N62269-73-C-0676)
(AD-A008540; TR-1068-J) Avail: NTIS CSCL 04/2

The configuration to be considered in the report is for an advanced dropsonde that will include several new options and will represent an improvement in performance over the previously discussed dropsonde with respect to several important criteria. The augmented capabilities of the advanced dropsonde include the achievement of continuous or near-continuous transmission of met data with real-time or near-real-time automatic processing, as well as provision for wind sensing, refractive index measurement and bathythermography. GRA

N75-25488# National Weather Service, Fort Worth, Tex. Southern Region.
AN OBJECTIVE AID TO FORECASTING SUMMERTIME SHOWERS OVER THE LOWER RIO GRANDE VALLEY OF SOUTH TEXAS
Nicholas P. Cimino and Larry M. Moore Jan. 1975 19 p refs
(COM-75-10307/7; NOAA-TM-NWS-SR-79;
NOAA-75021106) Avail: NTIS HC $3.25 CSCL 04B

Accurate precipitation forecasts are essential to a good weather service program for the agricultural community of the Lower Rio Grande Valley of South Texas. This local forecast study involves, primarily, the short range forecasting of areal coverage of summertime airmass showers over the valley by using predictor variables extracted from the lastest Brownsville atmospheric sounding. The highest correlated predictor variable with areal shower coverage was the combination of the mean relative humidity in the 850 mb to 700 mb layer and the 650 mb to 500 mb layer. In addition, these two predictors were used to construct a graph to estimate the average and maximum 24-hour precipitation amounts. GRA

N75-25489# Aeronautical Research Associates of Princeton, Inc., N.J.
INVARIANT MODELING OF TURBULENCE AND DIFFUSION IN THE PLANETARY BOUNDARY LAYER DUP
W. S. Lewellen, M. Teske, R. Contiliano, G. Hilst, and C. duP. Donaldson Sep. 1974 115 p refs
(Contract EPA-68-02-1310)
(PB-239323/9; ARAP-225; EPA-650/4-74-035) Avail: NTIS HC $5.25 CSCL 04B

Significant progress was made toward the goal of developing a viable computer model based on second-order closure of the turbulent correlation equations for predicting the fate of nonchemically reacting contaminants released in the atmospheric boundary layer. Sample calculations of several flow problems of current practical interest are included. They are (1) that of the diurnal variations in the the turbulence distributions in the planetary boundary layer induced by the unsteady surface heat flux, (2)the spatial variation of turbulence occurring when the wind blows over an abrupt change in surface roughness; and, (3) the dispersal of a plume released at different heights, under different stability conditions, and over different terrian. GRA

N75-25490# Fleet Numerical Weather Central, Monterey, Calif.
OPTIMUM TRACK SHIP ROUTING AT FNWC, MONTEREY
William M. Clune Jan. 1975 72 p
(COM-75-90008-01-01; NOAA-75010701-1) Avail: NTIS HC $4.25 CSCL 04B

The transfer of the U.S. Navy's Optimum Track Ship Routing (OTSR) service from Fleet Weather Central, Alamenda to the Fleet Numerical Weather Central (FNWC) in Monterey, CA. Provided OTSR the benefit of closer liaison with The Navy's primary center for computer-oriented meteorological support and development. While the basic ship routing service is still being provided, the association with civilian as well as Navy computer specialists has brought about some significant innovations to the problem of extended forecasting for ocean transits by ships. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N75-25491*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DETAILED GRAVIMETRIC GEOID CONFIRMATION OF SHORT WAVELENGTH FEATURES OF SEA SURFACE TOPOGRAPHY DETECTED BY THE SKYLAB S-193 ALTIMETER IN THE ATLANTIC OCEAN
J. G. Marsh, S. Vincent (Wolf R and D Corp., Riverdale, Md.), A. T. McClinton (Wolf R and D Corp., Riverdale, Md.), and E. S. Chang (Wolf R and D Corp., Riverdale, Md.) May 1975 20 p refs Submitted for publication
(NASA-TM-X-70905; X-921-75-110) Avail: NTIS HC $3.25 CSCL 08J

A detailed gravimetric geoid was computed for the Northwest Atlantic Ocean and Caribbean Sea area in support of the calibration and evaluation of the GEOS-C altimeter. This geoid, computed on a 15 ft. x 15 ft. grid was based upon a combination of surface gravity data with the GSFC GEM-6 satellite derived gravity data. A comparison of this gravimetric geoid with 10 passes of SKYLAB altimeter data is presented. The agreement of the two data types is quite good with the differences generally less than 2 meters. Sea surface manifestations of numerous short wavelength (approximately 100 km) oceanographic features are now indicated in the gravimetric geoid and are also confirmed by the altimetry data. Author

N75-25492# Environmental Prediction Research Facility (Navy), Monterey, Calif.
SURFACE CURRENTS DEDUCED FROM SHIP DRIFT AT THE PERIPHERY OF COSTA RICA DOME
T. Laevastu Feb. 1975 10 p ref
(Contract WF52551)
(AD-A008156; ENVPREDRSCHF-tech-note-17) Avail: NTIS CSCL 08/3

During a drift station at the periphery of Costa Rica Dome an approximately diurnal component of the surface drift current was discovered. The mean speed of this cum sole periodic current is 8 cm/sec. The sea land breeze effects and periodic atmospheric pressure wave are given as plausible explanation for the cause of this rotary current component. GRA

N75-25493# Royal Netherlands Meteorological Inst., De Bilt.
OCEANOGRAPHY OF THE RIA DE AROSA (N.W. SPAIN) Ph.D. Thesis-Utrecht Univ.
L. Otto 1975 212 p refs
(KNMI-102-96) Avail: NTIS HC $7.25; Roy. Neth. Meteorol. Inst. F 60,-

Oceanographic data of the Ria de Arosa in Northwestern Spain, collected during oceanographic campaigns in 1962, 1963, and 1964, are presented. The meteorology of the Ria de Arosa and its surroundings is discussed and the hydrology of the drainage basin of the river is dealt with. The oceanic area bordering the Galician west coast is discussed and the oceanographic situation of the Ria de Arosa in summer and in winter is presented. Turbidity and suspended matter observations are detailed and chemical data are given. Finally, circulation and mixing in the river are discussed. ESRO

N75-25494# Naval Research Lab., Washington, D.C.
WIND WAVE STUDIES. PART 2: THE PARABOLIC ANTENNA AS A WAVE PROBE
Tyrone R. Larson and John W. Wright 31 Dec. 1974 24 p refs
(NRL Proj. R07-17; WR02101002)
(AD-A006554; NRL-7850) Avail: NTIS CSCL 08/3

Coherent microwave backscatter is the basis of a probe technique useful for studying surface water waves in a laboratory tank. A parabolic antenna is focussed to give a plane wave at short range, typically 1.2 m, and an illuminated area of controllable size. The technique strongly discriminates against all water waves except those which have a particular Bragg resonant wavelength ranging between 0.25 cm and 10 cm and propagate parallel to the plane of incidence. The resulting doppler spectra provide a powerful tool for wind wave, breaking, and spray studies. A unique method for directly measuring the water wavenumber resolution is described, together with a technique for absolute calibration of the backscattered power in terms of wave height. GRA

N75-25495# Coastal Engineering Research Center, Fort Belvoir, Va.
THE USE OF AERIAL PHOTOGRAPHY IN THE STUDY OF WAVE CHARACTERISTICS IN THE COASTAL ZONE
Cecil M. McClenan and D. Lee Harris Jan. 1975 73 p refs
(DA Proj. C-31180)
(AD-A008011; CERC-TM-48) Avail: NTIS CSCL 08/3

Good aerial photos of waves show that multiple wave trains are common in the coastal zone. The relative importance of the various wave trains is changed by refraction and shoaling. The breakers, most prominent in the shore zone, often result from long, low swell, which is hardly discernable against the background of shorter waves a few hundred meters from shore. The generation of solitions and the regeneration of breakers which have crossed bars may lead to a breaker which is shorter than the period of the swell responsible for the breakers. Cylindrical waves radiating outward from rocks or shoals which penetrate the surface are formed from long-crested waves coming from the open sea. A wave pattern which appears random and chaotic when viewed on photos taken at a low elevation may appear to be highly organized when viewed at an elevation over 5,000 feet. GRA

N75-25496# Informatics, Inc., Rockville, Md.
SOVIET MATERIAL ON INTERNAL WAVE EFFECTS, NO. 3, APRIL 1975
Stuart G. Hibben, John Kourilo, B. L. Shresta, and M. Ness Apr. 1975 131 p
(Contract N00600-75-C-0018; DARPA Order 2790)
(AD-A007913) Avail: NTIS CSCL 08/3

This is the third collection of abstracts of recent Soviet articles on generation and detection of internal waves. It is based on items listed in the third Bibliography of Soviet Material on Internal Waves, published January 27, 1975 and covering material received from April through December, 1974. The abstracts are divided into internal effects, and surface effects comprising active and passive measurement of wave states. An author index is appended. GRA

N75-25497# Wisconsin Univ., Madison.
THE DISTRIBUTION AND ECOLOGY OF THE BENTHIC OSTRACODA FROM THE CENTRAL ARCTIC OCEAN M.S. Thesis
James Anthony Joy 1974 126 p refs
(Contract N00014-67-A-0123-0002)
(AD-A008548) Avail: NTIS CSCL 08/7

From the top 3 cm of 64 central Arctic Ocean sediment cores, 33 samples have been found to contain ostracodes. The cores were taken from depths between 1351 and 3812 m. Of the remaining 31 barren cores, 29 were taken from depths exceeding 3600 m in the Canada Basin. All 19 ostracode species constitute a bathyal fauna which extends to approximately 3000 m. The bathyal fauna is found along Alpha Cordillera and Chukchi Rise. Only Cytheropteron bronwynae n. sp. and Krithe bartonensis (Jones) occur below approximately 3000 m. These two species compose the abyssal fauna. The central Arctic ostracode faunas are more similar to the faunas of Scandinavia than to faunas of the northern Pacific. GRA

N75-25498# RAND Corp., Santa Monica, Calif.
MONTHLY AVERAGE SEA-SURFACE TEMPERATURES AND ICE-PACK LIMITS ON A 1 DEGREE GLOBAL GRID
R. C. Alexander and R. L. Mobley Dec. 1974 39 p refs
(Contract DAHC15-73-C-0181; ARPA Order 189-1)
(AD-A008575; R-1310-ARPA) Avail: NTIS CSCL 04/2

Climatological monthly ocean-surface temperatures obtained from the National Center for Atmospheric Research and from Fleet Numerical Weather Central are merged and interpolated onto a 1 degree global grid. Monthly distributions of the main ice packs of the Arctic and Antarctic are digitized from Fleet Weather Facility ice charts and Navy Atlases and then incorporated into the global arrays. Machine-analyzed maps show the 12 monthly distributions, and maps and tabulations of averages of these data for the months of February and August are shown on a global grid of 4 degrees latitude x 5 degrees longitude. GRA

N75-25499# Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
CLASSIFICATION OF COASTAL ENVIRONMENT OF THE WORLD Final Report
Bruce Hayden and Robert Dolan Feb. 1975 166 p refs
(Contract N00014-69-A-0060-0006; NR Proj. 389-158)
(AD-A008578) Avail: NTIS CSCL 08/6

The final report summarizes the products of more than four years of research in the classification of coastal environments and includes three manuscripts detailing the results and conclusions of three studies not issued in technical report form. The three studies included are titled Coastal Wave Climates of the Americas, Coastal Marine Fauna and Marine Climates of

the Americas, and An Assessment of Remote Sensing as a Tool in Classifying Coastal Landscape Elements. In addition, an evaluation of data quality, quantity, availability, and suitability for the purposes of classifying coastal environments is included.
GRA

N75-25500# Scripps Institution of Oceanography, La Jolla, Calif. Advanced Ocean Engineering Lab.
ADVANCED MARINE TECHNOLOGY Final Report, 15 Dec. 1968 - 31 Dec. 1974
William A. Nierenberg 1 Mar. 1975 16 p refs
(Contract N00014-69-A-0200-6012; NR Proj. 294-016)
(AD-A008415; AOEL-70; SIO-Ref-75-9) Avail: NTIS CSCL 08/3

This report is a compilation of the titles of papers, progress and scientific reports, thesis and other scientific findings prepared and presented under this contract for marine technology research.
GRA

N75-25501# Scripps Institution of Oceanography, La Jolla, Calif.
[DEVELOPMENT OF TWO-WAVELENGTH RADIOMETER FOR MEASUREMENT OF SEA SURFACE HEAT FLUX] Final Report, 15 Nov. 1967 - 14 Nov. 1974
Theodore D. Foster Apr. 1975 7 p refs
(Contract N00014-69-A-0200-6009)
(AD-A008420; SIO-Ref-75-12) Avail: NTIS CSCL 08/10

Research was conducted on the development of a two-wavelength radiometer for the measurement of the total heat flux from the sea surface and on convective processes in the ocean.
GRA

N75-25502# Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
THE ACQUISITION AND ANALYSIS OF WAVE DATA RECORDED ON A SPAR-BUOY MOUNTED DIGITAL CASSETTE RECORDER Final Report
Warren E. Colburn, Jr., Foster H. Middleton, and Lester R. LeBlanc Mar. 1974 59 p refs
(Contract DOT-CG-33962-A)
(AD-A007914; USCG-D-78-75) Avail: NTIS CSCL 08/3

This report concerns the design, fabrication, and operation of a wave measurement system. The system was required to operate without tethering, telemetering, or support from either a vessel or the sea floor. Another requirement was a rapid data processing ability, with a reliable spectral analysis of the wave height data taken during each of several operations. The damped spar buoy which served as the platform for the wave height sensors is described in the report. The wave height sensors were of the capacitor type and their associated electronic circuity is also given in the report. The wave height data was recorded on board the spar on a miniature digital cassette recorder. At the conclusion of each field test, the cassette containing the wave data was returned to the Ocean Engineering (URI) Laboratory for spectral analysis. The report contains an extensive presentation of the computer processing procedures (Fast Fourier Transform, window shading, power spectral density, frequency averaging, etc.).
GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N75-25503* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ROTARY PLANT GROWTH ACCELERATING APPARATUS Patent
Richard D. Dedolph, inventor (to NASA) Issued 13 May 1975 11 p Filed 27 Dec. 1973 Supersedes N74-13807 (12 - 05, p 0497)
(NASA-Case-ARC-10722-1; US-Patent-3,882,634; US-Patent-Appl-SN-428995; US-Patent-Class-47-1.2; US-Patent-Class-47-39; US-Patent-Class-47-58) Avail: US Patent Office CSCL 06C

Rotary plant growth accelerating apparatus for increasing plant yields by effectively removing the growing plants from the constraints of gravity and increasing the plant yield per unit of space is described. The apparatus is comprised of cylindrical plant beds supported radially removed from a primary axis of rotation, with each plant bed being driven about its own secondary axis of rotation and simultaneously moved in a planetary path about the primary axis of rotation. Each plant bed is formed by an apertured outer cylinder, a perforated inner cylinder positioned coaxially, and rooting media disposed in the space between. A rotatable manifold distributes liquid nutrients and water to the rooting media through the perforations in the inner cylinders as the plant beds are continuously rotated by suitable drive means.
Official Gazette of the U.S. Patent Office

N75-25504*# Biospherics, Inc., Rockville, Md.
AUTOMATED MICROBIAL METABOLISM LABORATORY Annual Report, 1974
Oct. 1974 218 p refs
(Contract NASw-2280)
(NASA-CR-142862) Avail: NTIS HC $7.25 CSCL 14B

The labeled release concept was advanced to accommodate a post- Viking mission designed to extend the search, to confirm the presence of, and to characterize any Martian life found, and to obtain preliminary information on control of the life detected. The advanced labeled release concept utilizes four test chambers, each of which contains either an active or heat sterilized sample of the Martian soil. A variety of C-14 labeled organic substrates can be added sequentially to each soil sample and the resulting evolved radioactive gas monitored. The concept can also test effects of various inhibitors and environmental parameters on the experimental response. The current Viking '75 labeled release hardware is readily adaptable to the advanced labeled release concept.
Author

N75-25505# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 9, NO. 2, 1975
5 Jun. 1975 162 p refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 3-85
(JPRS-64929) Avail: NTIS HC $6.25

Space flight and environmental stress effects on the human component in the man/spacecraft system are considered. For individual titles, see N75-25506 through N75-25527.

N75-25506 Joint Publications Research Service, Arlington, Va.
RESPIRATORY FUNCTION AND GRAVITATION c52
G. S. Belkaniya *In* Its Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 1-10 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 9-12 (For availability see N75-25505 16-51)

Changes in the respiratory function following alteration in the spatial position of the body can be considered a specific manifestation of the general mechanism of the antigravity function of the body. These changes are to compensate for the primary mechanical effects of gravity and to satisfy increased energy requirements of the body when standing. The mechanism of increased respiration acting through the somatic component of the antigravity function of the body is of great importance.
Author

N75-25507 Joint Publications Research Service, Arlington, Va.
HYPOXIC HYPOTHERMIA IN THE METABOLISM OF PHOSPHOLIPIDS OF THE ENDOCRINAL ORGANS OF RATS DURING ACUTE HYPOXIA c52
G. A. Gribanov *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 11-17 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 9-12 (For availability see N75-25505 16-51)

The effect of hypoxic hypothermia on the metabolism of phospholipids in the endocrinal organs (thyroid, adrenal, testicular glands) of albino rats has been studied. Hypoxic hypothermia which occurs during acute hypoxic produces no inhibitory effect on phospholipid metabolism in the thyroid, adrenal and testicular glands of the test animals. As a result of disturbed heat release the content of phospholipids in the thyroid and adrenal glands increases. The rate of label (P-32) incorporation into the phospholipids of every gland increases noticeably. This indicates an important compensatory role played by hypoxic hypothermia in phospholipid metabolism. The mechanisms of these phenomena are discussed. Author

N75-25508 Joint Publications Research Service, Arlington, Va.
CONTENT OF AMMONIA, GLUTAMINE, GLUTAMIC ACID IN RAT TISSUES DURING HYPOXIA AND AFTERWARD
M. M. Gabibov *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 18-24 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 12-16 (For availability see N75-25505 16-51)

The content of ammonia, glutamine, glutamic acid was measured in the brain, liver, heart, spleen, kidneys, skeletal muscles and blood of rats exposed to a 4-atm oxygen atmosphere and during aftereffects. The hyperoxic atmosphere resulted in an increase in ammonia and glutamic acid and a decrease in glutamine in the tissues. A return of the compounds to normal levels occurred slowly and nonuniformly, lasting for 40 to 60 days during the post-hyperoxia period. Author

N75-25509 Joint Publications Research Service, Arlington, Va.
GAS EXCHANGE AND SOME BLOOD INDICES ACCOMPANYING THYROID GLAND DYSFUNCTION c52
V. P. Dudarev, V. A. Kuzmenko, and V. I. Fedorchenko *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 25-31 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 16-20 (For availability see N75-25505 16-51)

Exposure of intact rats to a hyperoxic atmosphere of 2 atm for one hour a day for a period of 20 days induced no changes in gas exchange or hemoglobin and the content of red blood cells. The concentration of free radicals tended to decrease. Thyroidectomized rats kept in a normoxic atmosphere exhibited anemia and a decrease in gas exchange. The concentration of free radicals in the tissues decreased slightly. These parameters returned to normal after a hyperoxybaric exposure. During a normoxic exposure thyroxin injections accelerated gas exchange, producing no significant changes in composition of the red blood. Free-radical activity tended to increase. After a hyperoxybaric exposure similar changes were observed. Author

N75-25510 Joint Publications Research Service, Arlington, Va.
ACID-BASE STATE OF BLOOD WHEN BREATHING HYPERCAPNIC ATMOSPHERES c52
V. A. Glazkova and I. N. Chernyakov *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 32-42 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 20-27 (For availability see N75-25505 16-51)

The Astrup-Zigaard-Andersen method was used in investigating the acid-base balance in the blood of men and dogs exposed to hypercapnic atmospheres with a normal, increased and decreased oxygen content. A total of 164 experiments was carried out. Variations in acid-base equilibrium were compared with changes in physiological functions. The relationship between the acid-base balance and the carbon dioxide concentration, as well as the oxygen concentration in the breathing air was established. The toxic effects of acute hypercapnia and hyperoxia are shown to be cumulative. The positive effect of moderate hypercapnia on tolerance to normobaric hypoxia in long-term experiments is noted. Author

N75-25511 Joint Publications Research Service, Arlington, Va.
MEASUREMENT OF THE AMMONIA CONTENT IN THE ATMOSPHERE OF BIOSATELLITE MOCK-UPS AND ITS STANDARDIZATION c52
G. N. Pliskovskaya, A. L. Germanova, N. G. Ivanov, Ye. A. Ilin, V. M. Milyavskiy, and A. D. Noskin *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 43-50 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 27-32 (For availability see N75-25505 16-51)

The concentrations of ammonia having an irritating and acute effect on intact and hypokinetic rats were determined. The thresholds of the chronic effect were calculated for each group of animals. A 30-day period of hypokinesia increased animal sensitivity to ammonia: the threshold of the irritating effect decreased by a factor of two. The atmosphere in an enclosure equipped with an automatic life support system was examined during 30-day integrated animal experiments. Ammonia proved to be the major contaminant. Its concentration increased gradually, for the longest part of the experiments (28 days) remaining below the threshold of the chronic effect (40 mg/cu m). Author

N75-25512 Joint Publications Research Service, Arlington, Va.
PECULIARITIES OF ENERGY METABOLISM IN THE CENTRAL NERVOUS SYSTEM UNDER THE COMBINED INFLUENCE OF VIBRATION AND IRRADIATION c52
L. D. Lukyanova *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 51-58 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 32-37 (For availability see N75-25505 16-51)

Vibrations (70 Hz, 0.4 mm) have been shown to bring about cyclic changes in functioning of the respiratory chain in brain tissue. Short term (five minute) excitation may stimulate the respiratory function, whereas a longer (15 minute) exposure may weaken the energy control. Oxidative processes in the central nervous system and post vibration inhibition of higher cerebral compartments have been found to determine the development of radiation sickness in response to the combined effect of vibration and radiation. Author

N75-25513 Joint Publications Research Service, Arlington, Va.
EFFECT OF MECHANICAL VIBRATION ON THE SURFACE PROPERTIES OF SOLUTIONS OF GAMMA-GLOBULIN
V. K. Tkach, M. M. Demchenko, and V. T. Zheliba *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 59-64 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 37-40 (For availability see N75-25505 16-51)

The mechanical effect of vibration on gamma globulin was studied, stressing molecular structure changes. Author

N75-25514 Joint Publications Research Service, Arlington, Va.
TOXICOLOGICAL EVALUATION OF ETHYL ACETATE IN THE ATMOSPHERES OF SEALED CABINS c52
G. I. Solomin, G. M. Gorban, Yu. P. Bizin, G. P. Tikhonova, Z. I. Pilipyuk, Z. S. Dolgun, and V. A. Shchirskaya *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 65-71 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 40-44 (For availability see N75-25505 16-51)

Ethyl acetate was studied as an atmosphere contaminant in an enclosed environment. A 90 day continuous experiment on 160 white rats and 120 white mice with three concentrations of the compound (43, 10 and 2 mg/cu m) was carried out. Ethyl acetate used in the first two concentrations caused functional disturbances in the condition of the animals and morphological changes in their internal organs. Ethyl acetate at a concentration of 2 mg/cu m was ineffective. The collected data make possible the formulation of recommendations on the admissible concentrations of ethyl acetate vapors in an enclosed atmosphere in relation to different durations of human exposure. Author

N75-25515 Joint Publications Research Service, Arlington, Va.
CONSERVATION OF FOOD RESIDUES WITH A MIXTURE OF QUINOSOL AND SALICYLIC ACID c52
L. N. Rogatina, L. T. Poddubnaya, N. A. Kamennov, I. G. Popov, and P. P. Lobzin *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 72-78 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 44-48 (For availability see N75-25505 16-51)

A 90 day experiment has shown that a number of toxic gaseous contaminants are released into the atmosphere as a result of storage of mixed food wastes. The microorganisms living on decaying food wastes include different microbial species from the environment and food products. A preserving agent consisting of a mixture of quinosol and salicylic acid (1:1) was used. The agent inhibited microbial activity and terminated decay processes. This was indicated by a decline in the concentration of ammonia and amine compounds. In the presence of the agent fermentation processes, on the contrary, continued and decreased. Author

N75-25516 Joint Publications Research Service, Arlington, Va.
MEDICAL INVESTIGATIONS DURING FLIGHTS OF THE SPACESHIP SOYUZ-12, SOYUZ-13, SOYUZ-14 AND THE SALYUT-3 ORBITAL STATION c52
N. N. Gurovskiy, A. V. Yeremin, O. G. Gazenko, A. D. Yegorov, I. I. Bryanov, and A. M. Genin *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 79-87 Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 48-54 (For availability see N75-25505 16-51)

Medical results obtained during missions of the Soyuz-12, Soyuz-13 and Soyuz-14 spacecraft and the Salyut-3 orbital station are presented. The subjective feelings of the crew members (blood rush to the head, chest congestion, autonomic disturbances, etc.) and data from in-flight medical monitoring and medical experiments, as well as the countermeasures employed, are described in detail. Results of post flight medical examinations at rest and using functional tests are also summarized. It is concluded that no abnormalities in the vital physiological functions of crew members developed during the flight. The symptoms typical of the acute period of adaptation to weightlessness disappeared completely after the first flight days. Author

N75-25517 Joint Publications Research Service, Arlington, Va.
RADIATION SAFETY IN FLIGHTS IN HIGH-ALTITUDE AIRCRAFT c52
Ye. Ye. Kovalev and V. M. Petrov *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 88-95 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 54-59 (For availability see N75-25505 16-51)

The major sources of radiation hazard for flights of supersonic high altitude aircraft -- galactic and solar radiation -- are described. Estimates of the equivalent dose rate at different distances from these sources are given. The estimates are compared with the radiation doses allowed for the average population and special personnel. It is concluded that specific measures are needed to provide radiation safety of the crews and passengers aboard supersonic aircraft. Author

N75-25518 Joint Publications Research Service, Arlington, Va.
ACTIVATION OF EXTERNAL RESPIRATION AND THE LEVEL OF ALVEOLAR PCO2 OF IN-FLIGHT FLIERS c52
A. M. Genin, V. N. Polyakov, N. M. Asyamolova, V. K. Stepanov, and V. S. Yakovlenko *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 96-104 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 59-65 (For availability see N75-25505 16-51)

The appearance of spontaneous hypocapnia in real aircraft flights is discussed. Flight personnel were studied. The hypocapnic state was diagnosed on the basis of the CO2 concentration in alveolar air measured by using a special unit. In flight, the CO2 concentration in alveolar air decreased insignificantly (by 5 mm Hg on the average). In emergency situations, external respiration was activated to a greater extent. It is suggested that the alveolar PCO2 level is indicative of emotional stress. Author

N75-25519 Joint Publications Research Service, Arlington, Va.
EFFECT OF AN INCREASED OXYGEN AND CARBON DIOXIDE CONTENT ON VESTIBULAR TOLERANCE IN HUMAN SUBJECTS c52
S. S. Markaryan and I. A. Sidelnikov *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 105-110 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 65-68 (For availability see N75-25505 16-51)

Forty-two experiments on 21 test subjects, ages 20 to 40, were carried out to study possibilities of increasing vestibular tolerance. This was achieved by improving the cerebral blood supply of the subjects who breathed air with 40-43% oxygen, 2% carbon dioxide and nitrogen. The results were processed statistically. This respiratory mixture was found to increase tolerance of the vestibular analyzer to adequate stimuli. It is recommended that this respiratory mixture consisting of 40-43% oxygen, 2% carbon dioxide and nitrogen be used to prevent motion sickness and put an end to vestibular-autonomic disturbances which may appear in persons transported in different flight and surface vehicles. Author

N75-25520 Joint Publications Research Service, Arlington, Va.
FUNCTIONAL STATE OF THE VESTIBULAR ANALYZER WITH CREATION OF NEGATIVE PRESSURE ON THE LOWER HALF OF THE BODY c52
V. G. Voloshin and E. V. Lapayev *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 111-116 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 68-72 (For availability see N75-25505 16-51)

Using a caloric test, the functional state of the vestibular analyzer of nine male athletes was investigated during their exposure to lower body negative pressure tests. A prolongation of the latent period of caloric nystagmus and vertigo, shortening of nystagmus and vertigo time were observed. It is concluded that the cerebral blood supply plays a major role in the development of vestibular reflexes. Author

N75-25521 Joint Publications Research Service, Arlington, Va.
DETERMINATION OF HUMAN ENERGY EXPENDITURES IN CLOSED SPACES c52
I. A. Yevdayev and K. K. Shcherbakov *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 117-119 Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 72-73 (For availability see N75-25505 16-51)

A formula is derived for determining energy expenditures of a man present aboard a spaceship. Considered is the volume of released carbon dioxide when breathing pure oxygen or a gas mixture with a high content of oxygen. G.G.

N75-25522 Joint Publications Research Service, Arlington, Va.
METHOD FOR SAMPLING CONDENSING MICROIMPURITIES OF EXHALED AIR FOR SUBSEQUENT ANALYSIS BY THE GAS CHROMATOGRAPHY METHOD c25
Ye. Ye. Sotnikov *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 120-124 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 73-75 (For availability see N75-25505 16-51)

Total condensation of water soluble components and microimpurities from human exhaled air is attained in a liquid nitrogen cooled condenser/evaporator chromatograph. Analysis of pure individual components dissolved in water and subsequently held in three columns of different polarity establishes the concentration of the component in exhaled air. G.G.

N75-25523 Joint Publications Research Service, Arlington, Va.
COMPUTATION METHOD FOR DETERMINING OXYGEN CONSUMPTION OF A HUMAN SUBJECT IN A CLOSED SPACE c52
M. A. Vytchikova, G. M. Kuzmina, V. D. Peredkova, and B. A. Chirkov *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 125-130 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 76-79 (For availability see N75-25505 16-51)

The change in partial pressure of carbon dioxide in the microatmosphere of a closed chamber is used for determining oxygen consumption by the human body. G.G.

N75-25524 Joint Publications Research Service, Arlington, Va.
EXOCRINOUS FUNCTION OF THE LIVER OF RATS UNDER THE COMBINED INFLUENCE OF TRANSVERSE ACCELERATIONS AND RESTRICTED MOTOR ACTIVITY
I. L. Medkova and K. V. Smirnov *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 131-133 Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 79-80 (For availability see N75-25505 16-51)

The combined effect of transverse accelerations and prolonged restriction of motor activity on the principal components of bile secretions in the liver of rats was studied. Author

N75-25525 Joint Publications Research Service, Arlington, Va.
REACTION OF NEURONS IN THE VASOMOTOR CENTER OF A CAT TO STIMULATION OF THE VESTIBULAR AND SOMATIC AFFERENTS
S. N. Malikova and G. S. Ayzikov *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 134-139 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 80-83 (For availability see N75-25505 16-51)

Experience in space navigation has demonstrated that under spaceflight conditions it is possible to observe vascular reactions caused by exposure to weightlessness and irritation of the vestibular analyzer. The reaction of spontaneously active neurons of the bulbar vasomotor center to stimulation of the depressor nerve, vestibular and somatic afferents are studied. Author

N75-25526 Joint Publications Research Service, Arlington, Va.
RENDERING MEDICAL ASSISTANCE ABOARD A SPACESHIP c52
V. G. Terentyev and G. L. Yaroshenko *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 140-142 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 83-84 (For availability see N75-25505 16-51)

An increase in the duration of space flights and enlargement of the crew requires an intensification of attention to the problems involved in the medical support of flights, including investigations directed to the prevention of diseases and prediction of the probability of diseases. It is also necessary to clarify the possibilities and methods for carrying out therapeutic manipulations in a state of weightlessness. By means of mathematical prediction it was possible to determine the probable frequency of different diseases and states in crews consisting of 1 to 15 men on flight with a duration up to 1 to 12 months. Author

N75-25527 Joint Publications Research Service, Arlington, Va.
DEPENDENCE OF THE VIABILITY AND MUTABILITY OF CHLORELLA ON POST-RADIATION STORAGE CONDITIONS
I. S. Sakovich and L. K. Vekshina *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 143-145 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 84-85 (For availability see N75-25505 16-51)

Chlorella is a possible representative of a closed life support system for a spaceship crew; during the time of flight it will be exposed to cosmic radiation, and in particular, to periodic irradiation from solar flares. The reaction of Chlorella to fractional irradiation is studied in comparison with total single irradiation, and also the dependence of the radiobiological effect on the post-radiation conditions for keeping the culture. Author

N75-25528*# Food and Drug Administration, Cincinnati, Ohio. Food Research Lab.
ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Quarterly Progress Report, 1 Oct. - 31 Dec. 1974
A. L. Reyes Mar. 1975 16 p
(NASA Order W-13411)
(NASA-CR-142909; QPR-39) Avail: NTIS HC $3.25 CSCL 06M

A series of experiments was conducted to determine the dry heat resistance of microorganisms in soil obtained from Denver Colorado, Pasadena California, Kennedy Space Center Florida, and Cincinnati Ohio. The results of the KSC terminal sterilization cycle experiment are given in graphs. The average number of viable organisms per m1 was calculated for 18 replicate soil samples for each sample area and points plotted equivalent to 30 hr exposure at 112 C. The result showed a reduction of 3 logs from the initial population for both KSC and Cincinnati soil samples. Results from other areas are given in graphs. Author

N75-25529*# Scientific Translation Service, Santa Barbara, Calif.
STERILIZATION OF SOLUTIONS IN CONSIDERATION OF THE DYING KINETICS OF MICROORGANISMS AND THE DESTRUCTION OF SUBSTRATES
H. Musielski Washington NASA Jun. 1975 16 p refs Transl. into ENGLISH from Pharmazie (West Germany), v. 29, no. 12, 1974 p 783-786
(Contract NASw-2483)
(NASA-TT-F-16410) Avail: NTIS HC $3.25 CSCL 06M

The sterilization of solutions in blood preservation bottles is analyzed for a process of static cooling and pressure cooling with respect to the explained dying kinetics of microorganisms and the chemical substrate destruction, with the inactivation of vitamin B12 as an example. Using the reaction characteristics z and Q sub 10, process integrations are performed for the killing of microorganisms as well as for the chosen example of a thermochemical substrate destruction. By comparing the obtained data, the pressure cooling process turns out to be the least destructive one for the sterilization of nutrient media and infusion solutions at high sterilization temperatures. Author

N75-25530*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A CONTROL SYSTEM FORMULATION OF THE MECHANISM THAT CONTROLS THE SECRETIONS OF SERUM GROUP HORMONE IN HUMANS DURING SLEEP
James C. Howard and Donald R. Young Jun. 1975 7 p refs
(NASA-TM-X-62445; A-6107) Avail: NTIS HC $3.25 CSCL 06P

Plasma growth hormone concentrations during sleep were determined experimentally. An elevated level of plasma growth hormone was observed during the initial phase of sleep and remained elevated for approximately 3 hr before returning to the steady-state level. Moreover, subsequent to a prolonged interruption of sleep, of the order of 2-3 hr, an elevated level of plasma growth hormone was again observed during the initial phase of resumed sleep. A control system formulation of the mechanism that controls the secretions of serum growth hormone in humans was used to account for the growth hormone responses observed. Author

N75-25531*# Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Medicine.
TOXICOLOGIC EVALUATION OF THE MIGRATION OF A PLASTICIZER, DI (2-ETHYLHEXYL) PHTHALATE (DEHP) FROM VINYL PLASTICS Final Report
Robert J. Rubin 18 Apr. 1975 10 p
(Contract NAS5-22071)
(NASA-CR-143801) Avail: NTIS HC $3.25 CSCL 06C

The intravenous administration of DEHP solubilized by means of a number of different detergents leads to respiratory distress and death in rats. At autopsy the lungs are grossly enlarged, edamatous, and hemorrhagic. Light and electron microscopic evaluation of the lungs indicate engorgement of the interalveolar septa with edema fluid and polymorphonuclear leucocytes, degranulation of the leukocytes, and progessive destruction of the endothelial and epithelial cells. Consistent with the conclusion that solubilized DEHP results in a syndrome of 'shock lung' is the associated massive fall in arterial blood pressure and the prevention of the lung pathology by pretreatment with pharmacologic doses of an antiinflammatory steroid, methylprednisolone. Evidence is also presented that suggests that the DEHP inadvertently administered to humans during transfusions is also in a solubilized state in the plasma. Author

N75-25532*# Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Medicine.
ACUTE PULMONARY PATHOLOGY AND SUDDEN DEATH IN RATS FOLLOWING THE INTRAVENOUS ADMINISTRATION OF THE PLASTICIZER, DI (2-ETHYLHEXYL) PHTHALATE, SOLUBILIZED WITH TWEEN SURFACTANTS
Carl O. Schulz, Robert J. Rubin, and Grover M. Hutchins (John Hopkins Hospital) [1975] 35 p
(Contract NAS5-22071)
(NASA-CR-143803) Avail: NTIS HC $3.75 CSCL 06C

Intravenous administration of 200-300 mg/kg of di(2-ethylhexyl)phthalate (DEHP) solubilized in aqueous solutions of several Tween surfactants caused respiratory distress in rats. There was a dose-dependent lethality with death generally occurring within 90 minutes after injection. The lungs from DEHP:Tween treated animals were enlarged, generally darkened, and in some cases showed hemorrhagic congestion. Neither the overt symptoms nor the morphologic alterations resulting from

DEHP:Tween administration could be reproduced by intravenous administration of aqueous Tween solutions alone. The absence of pulmonary abnormalities following the intravenous administration of DEHP as an aqueous emulsion given either alone or even as soon as 2 minutes after pretreatment with Tween 80, suggests that the specific in vivo interaction between DEHP and Tween surfactants depends on the prior formation of water-soluble micelles of DEHP. Author

N75-25533# Princeton Univ., N.J. Dept. of Biology.
RESEARCH ON BIOLUMINESCENCE Final Report, 1970 - 1974
Frank H. Johnson 1 Apr. 1975 77 p refs
(Contract N00014-67-A-0151-0025; NR Proj. 108-860)
(AD-A007924) Avail: NTIS CSCL 06/1

The report reviews the research on bioluminescence under the subject contract, briefly listing the luminescence systems of the various types of bioluminescent organisms investigated with the objectives of isolating the determining properties and the chemical structure of the essential reactants; also, the reaction mechanisms and specific products involved in the process of light emission and factors influencing the photon yield. Brief discussions are included concerning accomplishments under previous contracts, as well as the significance of bioluminescence and background of research in this area. GRA

N75-25534# Illinois Univ., Chicago. Dept. of Biological Sciences.
OXYGEN CONSUMPTION AND RESPIRATORY QUOTIENT IN FIVE ANIMAL POPULATIONS NATURALLY EXPOSED TO SANGUINE ELECTROMAGNETIC FIELDS
Bernard Greenberg Mar. 1975 20 p refs
(Contract N00039-73-C-0030)
(AD-A008254) Avail: NTIS CSCL 06/18

The oxygen consumption and respiratory quotient (RQ) of five species of animals collected adjacent to the Sanguine antenna during summer, 1974, were tested. The species were: wood louse, Oniscus asellus; the earthworms, Lumbricus terrestris and L. rubellus; slug, Arion sp.; and redbacked salamander, Plethodon cinereus cinereus. Controls were collected on the same day, 6 to 13 miles from the nearest Sanguine antenna, and both test and control groups were tested simultaneously. No significant differences were found in the oxygen consumption or RQ between any test and control group of animals. GRA

N75-25553 Medical Physics Inst. Utrecht (Netherlands).
THE MESODIENCEPHALIC HIPPOCAMPAL SYSTEM: A QUANTITATIVE ANALYSIS OF THE MODULATION OF THETA RHYTHM
T. Paiva, F. H. LopesdaSilva, W. Mollevanger, and C. VanHulten *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 93-103 refs Sponsored in part by Found. for Fundamental Med. Res. (FUNGO) and Sci. Council of North Atlantic Treaty Organ. (For availability see N75-25543 16-52)

N75-25554 Medical Physics Inst. Utrecht (Netherlands).
FIELD POTENTIALS IN THE DENTATE AREA OF THE CAT: EXPERIMENTAL FINDINGS AND BIOPHYSICAL MODELS
A. VanRotterdam, A. Habets, and W. Wouters *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 104-113 refs (For availability see N75-25543 16-52)

N75-25555 Medical Physics Inst. Utrecht (Netherlands).
MOTOR CORRELATES OF OPERANTLY REINFORCED HIPPOCAMPUS THETA SHIFTS
D. E. A. T. Arnolds, F. H. LopesdaSilva, A. Kamp, and W. Aitink *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 114-120 refs Sponsored in part by Found. for Fundamental Med. Res. (FUNGO) (For availability see N75-25543 16-52)

N75-25556 Medical Physics Inst. Utrecht (Netherlands).
BEHAVIOURAL EFFECTS OF FRONTO-ORBITAL LESIONS IN DOGS
A. M. Thielen, H. DeGroen, W. StormvanLeeuwen, F. H. LopesdaSilva, and E. Bongartz *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 121-125 refs (For availability see N75-25543 16-52)

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N75-25535* + National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 140
Apr. 1975 99 p refs
(NASA-SP-7011(140)) Avail: NTIS HC $4.00 CSCL 06E

This bibliography lists 306 reports, articles, and other documents introduced into the NASA scientific and technical information system in March 1975. Author

N75-25536* + National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CUMULATIVE INDEX TO THE 1974 ISSUES OF A CONTINUING BIBLIOGRAPHY
Jan. 1975 525 p refs
(NASA-SP-7011(137)) Avail: NTIS HC $9.00 CSCL 06E

This publication is a cumulative index to the abstracts contained in supplements 125 through 136 of Aerospace Medicine and Biology: A Continuing Bibliography. It includes three indexes--subject, personal author, and corporate source. Author

N75-25537*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MEDICAL SUPPORT AND FINDINGS OF THE SKYLAB PROGRAM
Richard S. Johnston and Lawrence F. Dietlein Mar. 1975 40 p refs
(NASA-TM-X-58160; JSC-09383) Avail: NTIS HC $3.75 CSCL 06S

Specific equipment used in carrying out Skylab medical experiments is outlined and illustrated. Also included are reviews of the techniques, frequency, and protocols of the tests designed to study the long term effects of weightlessness on the human body. In-flight investigations were an evaluation of the cardiovascular system, a study of metabolic activity, investigations in the field of neurophysiology, the determination of changes in body fluids, a precise measurement of total body metabolism, and a study of crew performance by use of a time and motion experiment. Significant data obtained from in-flight and postflight tests are outlined. Author

N75-25538*# Kanner (Leo) Associates, Redwood City, Calif.
SALYUT 4: STADIUM IN WEIGHTLESSNESS
A. Gorokhov and V. Stepantsev Washington NASA Jun. 1975 7 p Transl. into ENGLISH from Zarya Vostoka (USSR) 5 Feb. 1975 p 4
(Contract NASw-2481)
(NASA-TT-F-16326) Avail: NTIS HC $3.25 CSCL 06P

The physical exercise program for the Salyut-4 crew is presented more systematically and in more detail than in previous reports. The cosmonauts' exercise equipment and its use are clearly noted, and the daily and weekly exercise regimen is analyzed; average load is about 450 kilocalories/24 hours. In addition, the program for wearing training load suits and the function of the suits are described; it is recommended that the suits be worn at least 8 hours per day. Author

N75-25539*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THERAPEUTIC HAND EXERCISER Patent Application
Donald E. Barthlome, inventor (to NASA) Filed 3 Jun. 1975 15 p
(NASA-Case-LAR-11667-1; US-Patent-Appl-SN-583487) Avail: NTIS HC $3.25 CSCL 06B

An apparatus is described for cyclic therapeutic exercise of incapacitated hands. It alternately imparts a straightening and bending motion to the fingers by the use of a splint-like inflatable member attached to the top of the hand and a lower pouch in the palm of the hand which pulls a flap tight around the fingertips. The basic operation of the invention in straightening the fingers is described. The upper pouch is inflated causing the fingers, which are attached to it by finger loops, to be straightened. When the upper pouch is deflated through a valve, the lower pouch is inflated, and this pulls a flap tight around the fingertips causing them to bend. Alternate inflation and deflation of the upper and lower pouches is accomplished by a pumping system, which, by use of a cycling valve, assures one pouch is always being deflated while the other is being inflated. NASA

N75-25540*# Boeing Aerospace Co., Houston, Tex.

A FEASIBILITY STUDY FOR AN EMERGENCY MEDICAL SERVICES SYSTEM TO SERVE THE PERMIAN BASIN IN THE STATE OF TEXAS Final Report

13 May 1975 10 p
(Contract NAS9-14397)
(NASA-CR-141853) Avail: NTIS HC $3.25 CSCL 06E

The development of an Emergency Medical Services System grant application for the Permian Basin Region of West Texas is described along with the application of NASA-developed technology. Conclusions and recommendations are included. Author

N75-25541*# Scientific Translation Service, Santa Barbara, Calif.

RADIATION SAFETY OF COSMONAUTS

Vitaliy Golovachev Washington NASA 12 Jun. 1975 6 p Transl. into ENGLISH from Trud (USSR), 1 Feb. 1975 p 2
(Contract NASw-2483)
(NASA-TT-F-16323) Avail: NTIS HC $3.25 CSCL 06R

Radiation monitoring in manned space flight is discussed with reference to the Salyut 4 and Soyuz 9 flights. Solar activity as the major source of dangerous radiation is explained and radiation dosages for the cosmonauts are reported. D.M.L.

N75-25542*# Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Medicine.

FATE IN HUMANS OF THE PLASTICIZER, DI (2-ETHYLHEXYL) PHTHALATE, ARISING FROM TRANSFUSION OF PLATELETS STORED IN VINYL PLASTICS BAGS

Robert J. Rubin and Charles A. Schiffer (Maryland Univ. Hospital) 1975 19 p refs
(Contract NAS5-22071)
(NASA-CR-143802) Avail: NTIS HC $3.25 CSCL 06E

Platelet concentrates were shown to contain 18-38 mg/100 ml of a phthalate plasticizer (DEHP) which arose by migration from the vinyl plastic packs in which the platelets were prepared and stored. Transfussion of these platelets into 6 adult patients with leukemia resulted in peak blood plasma levels of DEHP ranging from 0.34 - 0.83 mg/100 ml. The blood levels fell mono-exponentially with a mean rate of 2.83 percent per minute and a half-life of 28.0 minutes. Urine was assayed by a method that would measure unchanged DEHP as well as all phthalic acid-containing metabolities. In two patients, at most 60 and 90% of the infused dose, respectively, was excreted in the urine collected for 24 hours post-transfusion. These estimates, however, could be high due to the simultaneous excretion of DEHP remaining from previous transfusions or arising from uncontrolled environmental exposures. Author

N75-25543# Medical Physics Inst. Utrecht (Netherlands).

[RESEARCH ACTIVITIES IN APPLICATION OF PHYSICS AND ENGINEERING TO MEDICAL SCIENCE AND PROBLEMS]

B. VanEijnsbergen, ed. and F. L. LopesdaSilva, ed. Dec. 1974 228 p refs
(PR-4) Avail: NTIS HC $7.00

Studies in neuromuscular training and prostheses for handicapped, hemodynamic measurements, coronary arteriography, monitoring of cardiac and psychiatric patients, electrocardiography and electroencephalography data processing and integration, and human and animal electrophysiology are reviewed. For individual titles, see N75-25544 through N75-25573.

N75-25544 Medical Physics Inst. Utrecht (Netherlands).

FUNCTIONAL NEUROMUSCULAR TRAINING: EMG BIOFEEDBACK

H. H. Kwee, B. Venkatesh, and R. Soerjanto *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 13-17 refs (For availability see N75-25543 16-52)

The role of preprogrammed action patterns in neuromuscular control is stressed and a simplified scheme of the learning process to establish such programs is formulated. The potential of biofeedback techniques for the formation of new action programs when the old ones have failed due to pathological changes of the motor system is discussed. In particular, the use of electromyography feedback as an aid for the functional neuromuscular training in rehabilitation is considered and the design concepts of two instruments for this purpose are discussed. Author (ESRO)

N75-25545 Medical Physics Inst. Utrecht (Netherlands).

MYOELECTRIC TRAINING OF CONGENITAL BELOW-ELBOW STUMPS IN CHILDREN

R. Soerjanto *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 18-22 refs (For availability see N75-25543 16-52)

Rudimentary forearm muscles of children with congenital absence of a hand and of part of the forearm may, after special exercises, be used to control a myoelectric hand prosthesis. The children must be able to activate at least two rudimentary muscles or muscle groups independently of one another, with the signals of the action potentials of these muscles or muscle groups that are derived from the skin of the stump electrically influencing one another little or not at all. Of the nine children trained five were fitted with a myoelectric prosthesis. The technique and duration of the training, the equipment used, and the method of recording the training scores are discussed. The indications and the reasons why a prosthesis should be fitted at the earliest possible age are given. Author (ESRO)

N75-25546 Medical Physics Inst. Utrecht (Netherlands).

VACUUM DELATENCY CASTING FOR THE CONSTRUCTION OF INDIVIDUALLY MOLDED SEATS c54

F. H. Germans, M. W. Koster, H. H. Kwee, N. VdMey, R. Soerjanto, and D. W. Wijkmans *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 23-29 refs (For availability see N75-25543 16-52)

Merits of vacuum dilatency casting (VDC) technique for the production of faithful body impressions of patients suffering from sitting problems are discussed. Impressions are taken with the patients seated in the desired posture. A summary of the first 15 individual seats which were constructed according to body casts made with the VDC technique is presented. The range of potential applications for this technique includes, among others, prevention of decubitus, postural correction, postural support, and improvement of stability. Author (ESRO)

N75-25547 Medical Physics Inst. Utrecht (Netherlands).

FUNCTION OF THE LOWER BACK IN MAN. MEASUREMENT TECHNIQUE FOR RESEARCH INTO LOW BACK PAIN

J. During, H. Goudrooy, and T. W. Beeker *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 30-39 refs (For availability see N75-25543 16-52)

Complaints from low back pain patients are usually vague and nonspecific. The bio-mechanical functioning of the lower back in humans was studied. A description of a measurement method for the analysis of the behavior of the lower back as a component of the overall biomechanical behavior of the whole body is given. The system in and around the lower back is very complicated so that an investigation of this system involves many parameters. A measurement technique in which mechanical measurements are combined with electromyographic measurements is employed. Registrations of sagittal flexion and extension of healthy persons show a characteristic movement pattern which can be used as a basis for comparison with corresponding patterns of patients with low back pain. Author (ESRO)

N75-25548 Medical Physics Inst. Utrecht (Netherlands).

THE CARDIAC OUTPUT COMPUTER (COC) PROJECT c54

K. H. Wesseling, B. DeWit, J. A. P. Weber, and J. E. W. Beneken *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 44-50 refs (For availability see N75-25543 16-52)

Cardiac output being the amount of blood pumped by the heart in liters per minute, a simple inexpensive computer (COC) was devised for displaying the value of cardiac output at every beat in addition to stroke volume, heart rate, and mean arterial pressure in numerical form. The input required from the patient is a continuous arterial blood pressure signal which can only be obtained by invasive techniques. A pulse contour method is used for computing the continuous beat-to-beat value for cardiac output. The method is based on the transmission line theory-especially on the pressure-flow relationship - and an analog simulation is used for verifying hypotheses. The COC should be used for early warning systems in intensive care units or as a monitor during anesthesia. ESRO

N75-25549 Medical Physics Inst. Utrecht (Netherlands).

A METHOD FOR THE QUANTITATIVE EVALUATION OF THE HEMODYNAMIC EFFECT OF OBSTRUCTIONS IN THE CORONARY ARTERIES AS DEMONSTRATED BY CORONARY ARTERIOGRAPHY

K. H. Wesseling, P. Kloppenburg (Saint Antonius Hosp.), and A. V. G. Bruschke (Saint Antonius Hosp.) *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 51-59 refs (For availability see N75-25543 16-52)

A method is described by which it is possible to quantitatively evaluate coronary cineangiograms with respect to the influence of the size of the various coronary arteries and their obstructions on regional myocardial blood flow distribution. The method was tested in five coronary patients, one of which had atheromatous obstructions in one of the coronary arteries. Results compare to what is reported in the literature on myocardial blood flow distribution using different methods. Author

N75-25550 Medical Physics Inst. Utrecht (Netherlands).

SYSTOLIC TIME INTERVALS: THE EVALUATION OF A METHOD FOR CLINICAL DIAGNOSTIC USE

J. J. H. Donders, G. M. A. VanderHoeven, B. Snoek, and R. Kruizinga *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 60-69 refs (For availability see N75-25543 16-52)

The measurements of systolic time intervals (STI) during exercise is a provocative method which is useful in the diagnosis of cardiac function. The method is described and results of a clinical evaluation on normals and patients are given. About 80% of the cardiac patients with various stages of coronary artery disease and/or abnormal left ventricular contraction patterns are diagnosed correctly, with almost no false positives. A preprocessing unit to facilitate the measurement and to improve the signal-to-noise ratio and a digital computer program for the automatic recognition of the signals were developed. A program for the localization of the onset of ventricular depolarization (Q wave in ECG) is written but has to be evaluated for more different wave shapes. Maxima in the (approximate) second derivative of the carotid pulse indicate, within certain constraints, localization of upstroke and incisura. The ejection time is estimated with a standard deviation of 7 msec, with no systematic absolute error or any systematic error related to the RR interval. Parameters derived from the STI during exercise are evaluated to determine their diagnostic value. Author (ESRO)

N75-25551 Medical Physics Inst. Utrecht (Netherlands).

MONITORING AND CONTROL ASPECTS DURING HALOTHANE ANESTHESIA: SOME RESULTS OF COMBINED MODEL SIMULATION AND ANIMAL EXPERIMENTS

A. Zwart and A. VanDieren *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 70-82 refs Sponsored in part by Hoechst Co. (For availability see N75-25543 16-52)

Sinusoidal, step, and pulse wise changes in halothane concentration were used to study the dynamic behavior of cardiovascular variables and EEG. The brain perfusion was studied with Xe-133. A noninvasive technique which uses sinusoidal inputs to determine lung perfusion was introduced. A linear relationship was found between changes in stroke volume and changes in the halothane concentration in the spinal cord. The observation of oscillatory behavior in the Xe-133 washout curves resulted in a modification of the model for brain perfusion. This model can also explain the observed behavior of the EEG and the overshoot in the halothane concentration in the venus drain of the brain. Author (ESRO)

N75-25552 Medical Physics Inst. Utrecht (Netherlands).

EEG SIGNS OF CEREBROVASCULAR INSUFFICIENCY: AN APPLICATION OF SPECTRAL ANALYSIS OF THE EEG USING PROVOCATIVE METHODS

A. Kamp and J. Troost *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 86-92 refs (For availability see N75-25543 16-52)

A group of patients suffering from cerebrovascular insufficiency was submitted to a neurophysiological investigation. Their EEG was recorded at rest and during physical and mental activity. Two control normal groups, one of young (20 to 30 years) and another older (> 50 years) subjects, were also investigated. The EEGs were submitted to quantitative analysis by means of spectral analysis. Parameters which offered the best chance of differentiating the group of patients from the normals were determined. Deviations from normal emerged particularly when using provocative methods and they were mainly revealed in the form of a decrease in alpha frequency. The value of this pilot study for clinical use is discussed. Author (ESRO)

N75-25553 Medical Physics Inst. Utrecht (Netherlands).

THE MESODIENCEPHALIC HIPPOCAMPAL SYSTEM: A QUANTITATIVE ANALYSIS OF THE MODULATION OF THETA RHYTHM

c51

T. Paiva, F. H. LopesdaSilva, W. Mollevanger, and C. VanHulten *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 93-103 refs Sponsored in part by Found. for Fundamental Med. Res. (FUNGO) and Sci. Council of North Atlantic Treaty Organ. (For availability see N75-25543 16-52)

The hippocampal responses to stimulation of several mesodiencephalic inputs were quantitatively investigated in seven cats with chronically implanted electrodes. Noise modulated pulses were used for stimulation of the different input areas, so that a system analysis approach could be followed. The hippocampal EEG was analyzed by spectral analysis. Phase and coherence functions and time delays between input signal and output EEG were computed. The rhythmic activity of the hippocampus increased as a function of stimulus strength. Characteristic response patterns were described for each input area. These differed as regards the occurrence of shifts in theta peak frequency and the decrease in one or more theta frequency components below baseline levels at high stimulation voltage. Desynchronization (flat EEG spectrum) of hippocampal EEG took place with stimulation of the medial septum or with electrodes placed in the neighborhood of fiber tracts. The effects of carrier frequency and of modulation depth were investigated in detail. Linear phase relations between input and output were found, allowing the computation of delays between the stimulation area and the hippocampus response. These time delays differed according to the area of stimulation. The magnitude of the delay times suggests the existence of polysynaptic pathways arising in mesodiencephalic areas which are responsible for the generation of theta rhythm in the hippocampus. Author (ESRO)

N75-25554 Medical Physics Inst. Utrecht (Netherlands).

FIELD POTENTIALS IN THE DENTATE AREA OF THE CAT: EXPERIMENTAL FINDINGS AND BIOPHYSICAL MODELS

c51

A. VanRotterdam, A. Habets, and W. Wouters *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 104-113 refs (For availability see N75-25543 16-52)

Potentials evoked by electrical stimulation of the perforant path were recorded in the dentate area of the cat. In order to understand the generation of these evoked potentials, computer simulations were performed. The computer model described the membrane potentials as well as the extracellular propagation of currents. By comparison of experiments and model stimulations, it was confirmed that the assumptions concerning the geometry and electrical properties of the granular cell supported the current hypotheses concerning the electrical fields of the extracellular EPSPs and the population spike. The hypothesis that the late component in the evoked potential is a sign of somatic inhibition could not be supported by the model results. An alternative hypothesis for this component was put forward, namely, that it seems more probably that the granular cells are recurrently excited by means of the basket cells. The model can be extended to studies of the generation of more complex potentials evoked in population of neurons. Author (ESRO)

N75-25555 Medical Physics Inst. Utrecht (Netherlands).
MOTOR CORRELATES OF OPERANTLY REINFORCED HIPPOCAMPUS THETA SHIFTS c51
D. E. A. T. Arnolds, F. H. LopesdaSilva, A. Kamp, and W. Aitink *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 114-120 refs Sponsored in part by Found. for Fundamental Med. Res. (FUNGO) (For availability see N75-25543 16-52)

Dogs which are given a food reward each time the peak frequency of their hippocampal theta rhythm shifts to a value higher than 5.4 or 5.5 Hz will produce many more theta shifts per unit of time than before they were rewarded. Thus, the probability of the occurrence of theta shifts can be increased by their operant reinforcement. The behavior related to the theta shifts was assessed quantitatively. Significantly associated with the theta shifts are transitions in gross motor activity and in head position which appear to have the swiftness of the animal's movements in common. It is proposed that behavior correlates of hippocampal theta frequency are found in terms of elementary characteristics of motor acts. Author (ESRO)

N75-25556 Medical Physics Inst. Utrecht (Netherlands).
BEHAVIOURAL EFFECTS OF FRONTO-ORBITAL LESIONS IN DOGS c51
A. M. Thielen, H. DeGroen, W. StormvanLeeuwen, F. H. LopesdaSilva, and E. Bongartz *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 121-125 refs (For availability see N75-25543 16-52)

Dogs which showed an abnormal level of anxious behavior towards humans were investigated in order to find out whether electrocoagulation of the fronto-orbital and/or cingular brain areas caused a change in that behavioral state. The dog's behavior was quantified according to ethological methods. An operational definition of the dog's anxiety reaction was obtained. It was found that there was no clear change in this respect after coagulation of the lateral fronto-orbital areas; however, the coagulation led to an increase in eating and in motor behavior. Author (ESRO)

N75-25557 Medical Physics Inst. Utrecht (Netherlands).
SOME INVESTIGATIONS ON THE ELECTRICAL ACTIVITY OF THE HUMAN ORBITO-FRONTAL CORTEX
W. Vliegenthart, A. Kamp, and W. StormvanLeeuwen *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 126-132 refs (For availability see N75-25543 16-52)

A neurophysiological study of the orbito-frontal cortex of a psychiatric patient in whom depth electrodes were implanted is reported. Beta bursts were found which are characterized as rhythmic paroxysms with amplitudes between 100 to 250 microvolts within the 14 to 20 Hz band. The occurrence of these bursts was clearly associated with the performance of mental arithmetic and word association tests. Author (ESRO)

N75-25558 Medical Physics Inst. Utrecht (Netherlands).
STEREOTACTIC APPARATUS FOR THE INTRODUCTION OF ELECTRODES INTO THE BRAIN OF THE HUMAN
A. Kamp and H. W. DeSoete *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 133-136 ref (For availability see N75-25543 16-52)

A new stereotactic apparatus for the implantation of electrodes in the human brain is described. The apparatus consists of three parts, which are assembled during the course of the operation: (1) base unit rigidly fixed to the operation table, (2) head holder fixed to the skull by means of 4 point-screws, and (3) a trephine guide system providing three-dimensional positioning and guidance for a trephine by means of which bundles of gold wire are introduced. ESRO

N75-25559 Medical Physics Inst. Utrecht (Netherlands).
DETECTION OF NONSTATIONARITIES IN EEG's USING THE AUTOREGRESSIVE MODEL: AN APPLICATION OF EEG's OF EPILEPTICS
F. H. LopesdaSilva, A. Dijk, and H. Smits *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 137-148 refs (For availability see N75-25543 16-52)

The description of EEGs in terms of autoregressive models is theoretically presented as well as the practical problem of determining the order of the adequate model. In this way EEGs are accounted for in terms of a filtered noise. A method for detection of nonstationarities in EEGs is derived by determining the statistical properties of the noise term which results from passing the EEG through the inverse of the corresponding autoregressive filter. The detection method is extended to include a matched filter operation. These methods were applied to EEGs of epileptic patients. In order to evaluate the results of the detection method, it was applied to EEG recordings simultaneously obtained from the scalp and from the deeper tissue by means of implanted electrodes in an epileptic patient. In this way pulse-shaped signals recorded from the scalp and detected by the computer procedure were characterized, some of these were not clinically classified as being of epileptic origin. Simultaneous analysis of depth recordings allowed correlation of these nonstationarities with irritative phenomena recorded from the brain depth. ESRO

N75-25560 Medical Physics Inst. Utrecht (Netherlands).
DOUBLE-PULSE EXCITATION OF PIEZOELECTRIC TRANSDUCERS c35
J. C. Somer and W. J. Kooij *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 150-154 refs (For availability see N75-25543 16-52)

An investigation was made to find an excitation signal for an arbitrarily loaded and backed piezoelectric transducer generating the optimum acoustic output. Several steps are involved. The impulse response in the unlimited bandwidth case is used as a basis, after which a suitable combination of two excitation impulses is sought. A practical circuit for generating a simplified version of the theoretically required input signal is described and the pulse shape obtained. The resolution capability and the effect on the directional pattern are shown. ESRO

N75-25561 Medical Physics Inst. Utrecht (Netherlands).
FREQUENCY DOMAIN ANALYSIS OF PULSE TRAINS c63
M. TenHoopen *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 156-164 refs (For availability see N75-25543 16-52)

A comparison is made between autocovariance functions and power spectra of pulse trains on the basis of model processes with emphasis on rhythm detection aspects. In addition, coherence functions between partly dependent pulse trains are considered. Author (ESRO)

N75-25562 Medical Physics Inst. Utrecht (Netherlands).
SECOND-ORDER CORRELATIONS AND BISPECTRA OF COMPOSITE RHYTHMS c63
M. TenHoopen and P. A. Zandt *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 165-171 ref (For availability see N75-25543 16-52)

Some properties of the second-order autocorrelation function and frequency spectrum in relation to those of the conventional first order versions were studied with the help of a model that is believed to mimic certain physiological time series and containing more than one periodicity. The model consists of the superposition of two series of oscillatory wave packets occurring randomly and more or less in synchrony. In contrast to the first order measures, which are hardly able to differentiate between loose and tight coupling of the two components, the second order functionals are able to do so, at least within a limited range of parameter values. Author (ESRO)

N75-25563 Medical Physics Inst. Utrecht (Netherlands).
QRS AND ST-T TYPIFICATION
J. H. VanBemmel and S. J. Hengeveld *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 174-181 refs (For availability see N75-25543 16-52)

The typification of ventricular complexes in an ECG recording is of great importance for computer interpretation. For the contour analysis the dominant beat has to be determined, whereas the presence of other waveshapes has to be stated for rhythm analysis. This contribution describes an algorithm for this typification based on the computation of the covariance matrix of the ECG signals after digital filtering. The performance of the method was evaluated with the help of a testing population of electrocardiograms. The algorithm was implemented in a modular system for ECG/VEG processing. Author (ESRO)

N75-25564 Medical Physics Inst. Utrecht (Netherlands).
A RELIABLE QRS-DETECTOR FOR CORONARY CARE UNIT (CCU) MONITORING
C. A. Swenne, M. Hermans, and D. Hordijk *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 182-184 ref Sponsored by Neth. Heart Found. (For availability see N75-25543 16-52)

A method for detecting ventricular contractions in an arbitrarily chosen, one-lead electrocardiogram is described. The method is implemented in hardware and is part of a patient monitoring system. The detector was applied to a population of signals; the results are given. Author (ESRO)

N75-25565 Medical Physics Inst. Utrecht (Netherlands).
A PILOT SYSTEM FOR MONITORING THE ELECTROCARDIOGRAM IN A CORONARY CARE UNIT
C. A. Swenne and J. S. Duisterhout *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 185-187 refs Sponsored by Neth. Heart Found. (For availability see N75-25543 16-52)

A computerized monitoring system which was used in a coronary care unit is discussed. The system is able to discriminate between different (EGG) wave forms for one patient and provides warnings and alarms if the condition of the patient deteriorates. Typical for the system is that interactive and adaptive aspects try to take the patient as his own standard of reference. Author (ESRO)

N75-25566 Medical Physics Inst. Utrecht (Netherlands).
STOCHASTIC OPERATIONS ON CCU ELECTROCARDIO - GRAMS
C. A. Swenne and J. C. Looyen *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 188-192 ref Sponsored by Neth. Heart Found. (For availability see N75-25543 16-52)

When analyzing electrocardiograms, one is always confronted with the problem of the detection of ventricular (QRS) complexes. A method for optimizing the detection parameters of such a detector intended for operation in a coronary care unit (CCU) is described. Optimization is done with two populations, each consisting of 54 different patterns; the results for these two populations are compared. The aim of this method is to find criteria for a good working detector which can be used in a coronary care unit. The detector tested consists of a band pass filter, some preprocessing stage, and five parallel partial detectors. Bandpass filtering is done to remove disturbances in the electrocardiogram caused by respiration, low-frequency, and 50 Hz hum and muscle noise (high-frequency). The cut-off-frequencies of the filters are 8 and 25 Hz; the slopes about 12db/octave. The gain of the filter is chosen in such a way that the maximum amplitude of each QRS complex has a fixed value. Thereafter, the signal is rectified. Each of the five partial detectors consists of a pulse shaper and a candidate shaper. Author (ESRO)

N75-25567 Medical Physics Inst. Utrecht (Netherlands).
A DECISION TREE FOR ARRHYTHMIA DIAGNOSIS AS PART OF A MODULAR VCG/ECG ANALYSIS SYSTEM
J. T. Hoogakker and H. W. M. Plokker *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 193-198 refs (For availability see N75-25543 16-52)

A computer program for automatic classification of arrhythmias is described. The program is part of a total modular electrocardiogram/vectorcardiogram analysis systems. In addition, a very short description of the module P-wave finder is presented. Author (ESRO)

N75-25568 Medical Physics Inst. Utrecht (Netherlands).
PATIENT MONITORING DURING CARDIAC SURGERY WITH AID OF THE EEG
R. A. F. Pronk and A. J. R. Simons (Saint Antonius Hosp.) *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 199-201 ref (For availability see N75-25543 16-52)

The electroencephalogram was used during open heart cardiac surgery for patient monitoring. A reduced 10 to 20 system of electrode placement was used consisting of 11 electrodes on the scalp and one ground electrode on the shoulder. The electrode impedance must be smaller than 3 k omega, and disturbances must be eliminated. Zero crossing histograms and amplitude histograms were continuously determined by a small computer to detect trends in the patient's condition. ESRO

N75-25569 Medical Physics Inst. Utrecht (Netherlands).
SOFTWARE QRS-WAVE DETECTION OF VCG's AND ECG's
R. A. F. Pronk *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 202-205 ref (For availability see N75-25543 16-52)

A computer program was written for the determination of reference points in QRS-waves of vectorcardiograms and eletrocardiograms. The lead systems employed were the Frank lead system and the standard 12-lead system. The program was applied to lead groups of three simultaneously recorded leads. The results can be used for contour classification as well as for rhythm diagnosis of electrocardiograms. Author (ESRO)

N75-25570 Medical Physics Inst. Utrecht (Netherlands).
PROGRESS IN DIAGNOSING ELECTROCARDIOGRAMS
J. L. Talmon and G. VanHerpen *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 206-209 (For availability see N75-25543 16-52)

Measurements which are used in an automated vectorcardiogram processing system to classify the repolarization of the ventricle are described. Results of a classification program in which these measurements are used for independent patient material are presented. Author (ESRO)

N75-25571 Medical Physics Inst. Utrecht (Netherlands).
THE ST SLOPE
C. A. Ascoop (Saint Antonius Hosp.), C. A. Distelbrink, and P. A. DeLang *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 210-215 refs (For availability see N75-25543 16-52)

As a part of a larger study about electrocardiography during exercise in ischaemic heart disease, the diagnostic value of several ST slope criteria were examined. In a group of 87 patients the results were compared with findings from coronary arteriography. Higher diagnostic scores were reached than according to the conventional criterion of the ischaemic signs in electrocardiograms. ESRO

N75-25572 Medical Physics Inst. Utrecht (Netherlands).
MODULAR SOFTWARE FOR ECG/VCG PROCESSING
J. S. Duisterhout *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 216-221 refs (For availability see N75-25543 16-52)

The software architecture of a modular computerized vectorcardiogram/electrocardiogram m processing system is described. Design specifications and the reasons for this development are discussed and a short description of all of the modules is given. Author (ESRO)

N75-25573 Medical Physics Inst. Utrecht (Netherlands).
A METHOD FOR DETECTING EPILEPTIC SEIZURES
C. VanNimwegen, J. Boter, and B. VanEijnsbergen *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 224-228 ref (For availability see N75-25543 16-52)

An instrument by means of which epileptic seizures can be detected is described. Vibrations of a bed due to patient movements are converted into electric pulsations by means of a movement-transducer. To distinguish between normal movements and these caused by an epileptic seizure, three criteria are used, namely, the amplitude of pulsations, the time interval between pulsations, and the duration of a group of pulsations. Clinical use of the instrument confirms that it satisfactorily meets the requirements. Author (ESRO)

N75-25574# Rochester Univ., N.Y.
CONSIDERATIONS IN ANIMAL EXPERIMENTATION TO ASSESS BIOLOGIC EFFECTS AND POTENTIAL HAZARDS

OF EXPOSURE TO LASERS
S. M. Michaelson 1974 10 p refs Presented at Working Group on Health Effects from Lasers, Dublin, 20 Oct. 1974 Sponsored by ERDA
(UR-3490-630; Conf-741069-2) Avail: NTIS HC $3.25

Permissible exposure levels to laser energy have been extrapolated from animal data and are based on minimum physical ophtalmoscopic and histologic changes. Uncertainties exist in extrapolation of animal data to humans. Choice of the experimental animal species is of prime importance. Author (NSA)

N75-25575# Geoscience, Ltd., Solana Beach, Calif.
NERVE REGENERATION SUMMARY PROJECT
H. F. Poppendiek and D. J. Connelly Apr. 1975 10 p refs
(Contract N00014-74-C-0305)
(AD-A008569; GLR-149) Avail: NTIS CSCL 06/16

The nerve action potential monitoring concept was tested in the laboratory during in vitro and in vivo experiments using sciatic nerves of frogs and rabbits. Electrode designs were developed which involved piercing of the nerve sheaths thereby making reliable nerve contacts. Methods of electrically insulating electrodes and lead wires were developed which reduced muscle action potential interference. A series of nerve action potential experiments, electrical insulation tests and electrode attachment tests were performed in the laboratory verifying the designs and concepts which are to be tried by the neurosurgeon in NAP monitoring of peripheral nerve regeneration. Over thirty-five electrically insulated stimulating and sensing electrodes were fabricated. Special electrode attachment jigs for nerves were also fabricated. GRA

N75-25576# California Univ., Los Angeles. Lab. of Environmental Neurobiology.
AN EVALUATION OF POSSIBLE EFFECTS OF 45 Hz, 60 Hz AND 75 Hz ELECTRIC FIELDS ON NEUROPHYSIOLOGY AND BEHAVIOR OF MONKEYS. PHASE 1: CONTINUOUS WAVES
R. Gavalas-Medici and S. R. Magdaleno Apr. 1975 301 p refs
(Contract N00014-69-A-0200-4037)
(AD-A008404) Avail: NTIS CSCL 06/18

Five monkeys were well trained on a Skinnerian schedule in which a five sec interval between responses was reinforced. After a stable level of responding had been achieved, monkeys were exposed to a random series of several electric field configurations with frequencies of 7 Hz, 45 Hz, 60 Hz or 75 Hz and with voltage levels of 1, 10, 56 or 100 V/m p-p. At 1 V/m p-p there was no discernible effect on either behavior or electrical brain waves. (This is approximately 5 times the voltage associated with Project Sanguine.) At 10 V/m there was evidence for a frequency-specific threshold at 7 Hz. Time between responses (interresponse times) was significantly shorter and variability of responding was reduced. When voltage was increased to 56 V/m direction of the effect was the same as at 10 V/m and the magnitude of the change was markedly increased for both 7 Hz and 75 Hz fields. At 100 V/m there was some evidence for a carry-over effect from one day to the next. GRA

N75-25577# IIT Research Inst., Chicago, Ill.
ELF COUPLING TO BIOSPHERES
R. J. Spiegel Mar. 1975 27 p refs
(Contract N00039-73-C-0030)
(AD-A008276; IITRI-E6249-3) Avail: NTIS CSCL 06/18

The induced fields, currents and power absorbed by spherical models of humans or animals when exposed to ELF electromagnetic fields are calculated in this report. It is shown by a quasi-static approximation that the induced field is comprised of two components: an electric term and a magnetic term. The relative importance of each term is discussed. It is concluded that chronic biological effects of an acute nature (such as body heating or neural activity) are unlikely to occur from ELF electromagnetic fields of low intensity. GRA

N75-25578# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
TOXICITY OF ENGINE EXHAUST GASES: DIESEL-BROMOCHLOROMETHANE FUEL BLEND Final Report
Alan A. Johnston, Karl Springer, Don Johnson, Dennis Boenig, and Frank Newman Feb. 1975 40 p refs
(Contract DAAD05-72-C-0053)
(AD-A008088; AFLRL-51) Avail: NTIS CSCL 06/20

A single cylinder diesel engine was used to generate exhaust gases formed during the combustion of diesel fuel containing five percent by vol bromochloromethane, as a fuel additive. An exhaust gas dilution system permitted exposure of selected animal species to the products of combustion diluted with fresh air at air/gas ratios of 10:1, 20:1, 50:1, 75:1 and 100:1. Acute toxicity of the exhaust components in the selected animals was defined during a 4-hr exposure test, followed by a 14-day observation period. Histopathology studies of all major organs were also accomplished. Exhaust gas samples were analyzed for organic and inorganic halogen compounds. GRA

N75-25579# Undersea Medical Society, Bethesda, Md.
EARLY INDICATIONS OF BEHAVIORAL AND PHYSIOLOGICAL DYSFUNCTIONING IN DEEP DIVES Special Report
Arthur J. Bachrach and Mark E. Bradley 20 Mar. 1975 39 p Presented at the Undersea Medical Society 3d Workshop, San Diego, Calif., 3-4 May 1973
(Contract N00014-74-C-0319)
(AD-A008537; WS-3-30-75) Avail: NTIS CSCL 06/19

The report consists of an informal narrative account of discussions based on brief presentations. There were four sessions: (1) Performance: Chairman, Dr. Glen Egstrom; (2) High pressure nervous syndrome: Chairman, Peter Bennett; (3) Vestibular symptomatology: Chairman, LCDR Robert S. Kennedy; (4) Electroencephalography: Chairman, Dr. Paul Naitoh. GRA

N75-25580# Bureau of Radiological Health, Rockville, Md.
INDEX TO SELECTED ACOUSTIC AND RELATED REFERENCES
Jan. 1975 427 p refs
(PB-239805/5; DHEW/FDA-75-8025) Avail: NTIS HC $11.25 CSCL 06R

The index to selected acoustic and related references provides a poled set of references pertaining to the uses, measurement, and effects of acoustic energy with special emphasis in the area of ultrasound. It was developed to aid in the retrieval of articles on the subject of acoustic radiation. The document is divided into three sections: KWIC Index, Author Index, and Bibliography. GRA

N75-25506 Joint Publications Research Service, Arlington, Va.
RESPIRATORY FUNCTION AND GRAVITATION
G. S. Belkaniya *In* Its Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 1-10 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 9-12 (For availability see N75-25505 16-51)

N75-25507 Joint Publications Research Service, Arlington, Va.
HYPOXIC HYPOTHERMIA IN THE METABOLISM OF PHOSPHOLIPIDS OF THE ENDOCRINAL ORGANS OF RATS DURING ACUTE HYPOXIA
G. A. Gribanov *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 11-17 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 9-12 (For availability see N75-25505 16-51)

N75-25509 Joint Publications Research Service, Arlington, Va.
GAS EXCHANGE AND SOME BLOOD INDICES ACCOMPANYING THYROID GLAND DYSFUNCTION
V. P. Dudarev, V. A. Kuzmenko, and V. I. Fedorchenko *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 25-31 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 16-20 (For availability see N75-25505 16-51)

N75-25510 Joint Publications Research Service, Arlington, Va.
ACID-BASE STATE OF BLOOD WHEN BREATHING HYPERCAPNIC ATMOSPHERES
V. A. Glazkova and I. N. Chernyakov *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 32-42 refs Transl. into ENGLISH from Kosm. Biol. i

Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 20-27 (For availability see N75-25505 16-51)

N75-25511 Joint Publications Research Service, Arlington, Va.
MEASUREMENT OF THE AMMONIA CONTENT IN THE ATMOSPHERE OF BIOSATELLITE MOCK-UPS AND ITS STANDARDIZATION
G. N. Pliskovskaya, A. L. Germanova, N. G. Ivanov, Ye. A. Ilin, V. M. Milyavskiy, and A. D. Noskin *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 43-50 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 27-32 (For availability see N75-25505 16-51)

N75-25512 Joint Publications Research Service, Arlington, Va.
PECULIARITIES OF ENERGY METABOLISM IN THE CENTRAL NERVOUS SYSTEM UNDER THE COMBINED INFLUENCE OF VIBRATION AND IRRADIATION
L. D. Lukyanova *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 51-58 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 32-37 (For availability see N75-25505 16-51)

N75-25514 Joint Publications Research Service, Arlington, Va.
TOXICOLOGICAL EVALUATION OF ETHYL ACETATE IN THE ATMOSPHERES OF SEALED CABINS
G. I. Solomin, G. M. Gorban, Yu. P. Bizin, G. P. Tikhonova, Z. I. Pilipyuk, Z. S. Dolgun, and V. A. Shchirskaya *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 65-71 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 40-44 (For availability see N75-25505 16-51).

N75-25515 Joint Publications Research Service, Arlington, Va.
CONSERVATION OF FOOD RESIDUES WITH A MIXTURE OF QUINOSOL AND SALICYLIC ACID
L. N. Rogatina, L. T. Poddubnaya, N. A. Kamennov, I. G. Popov, and P. P. Lobzin *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 72-78 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 44-48 (For availability see N75-25505 16-51)

N75-25516 Joint Publications Research Service, Arlington, Va.
MEDICAL INVESTIGATIONS DURING FLIGHTS OF THE SPACESHIP SOYUZ-12, SOYUZ-13, SOYUZ-14 AND THE SALYUT-3 ORBITAL STATION
N. N. Gurovskiy, A. V. Yeremin, O. G. Gazenko, A. D. Yegorov, I. I. Bryanov, and A. M. Genin *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 79-87 Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 48-54 (For availability see N75-25505 16-51)

N75-25517 Joint Publications Research Service, Arlington, Va.
RADIATION SAFETY IN FLIGHTS IN HIGH-ALTITUDE AIRCRAFT
Ye. Ye. Kovalev and V. M. Petrov *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 88-95 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 54-59 (For availability see N75-25505 16-51)

N75-25518 Joint Publications Research Service, Arlington, Va.
ACTIVATION OF EXTERNAL RESPIRATION AND THE LEVEL OF ALVEOLAR PCO2 OF IN-FLIGHT FLIERS
A. M. Genin, V. N. Polyakov, N. M. Asyamolova, V. K. Stepanov, and V. S. Yakovlenko *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 96-104 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 59-65 (For availability see N75-25505 16-51)

N75-25519 Joint Publications Research Service, Arlington, Va.
EFFECT OF AN INCREASED OXYGEN AND CARBON DIOXIDE CONTENT ON VESTIBULAR TOLERANCE IN HUMAN SUBJECTS
S. S. Markaryan and I. A. Sidelnikov *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 105-110 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 65-68 (For availability see N75-25505 16-51)

N75-25520 Joint Publications Research Service, Arlington, Va.
FUNCTIONAL STATE OF THE VESTIBULAR ANALYZER WITH CREATION OF NEGATIVE PRESSURE ON THE LOWER HALF OF THE BODY
V. G. Voloshin and E. V. Lapayev *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 111-116 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 68-72 (For availability see N75-25505 16-51)

N75-25521 Joint Publications Research Service, Arlington, Va.
DETERMINATION OF HUMAN ENERGY EXPENDITURES IN CLOSED SPACES
I. A. Yevdayev and K. K. Shcherbakov *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 117-119 Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 72-73 (For availability see N75-25505 16-51)

N75-25523 Joint Publications Research Service, Arlington, Va.
COMPUTATION METHOD FOR DETERMINING OXYGEN CONSUMPTION OF A HUMAN SUBJECT IN A CLOSED SPACE
M. A. Vytchikova, G. M. Kuzmina, V. D. Peredkova, and B. A. Chirkov *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 125-130 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 76-79 (For availability see N75-25505 16-51)

N75-25526 Joint Publications Research Service, Arlington, Va.
RENDERING MEDICAL ASSISTANCE ABOARD A SPACESHIP
V. G. Terentyev and G. L. Yaroshenko *In its* Space Biol. and Aerospace Med., Vol. 9, No. 2, 1975 (JPRS-64929) 5 Jun. 1975 p 140-142 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), v. 9, no. 2, Mar. - Apr. 1975 p 83-84 (For availability see N75-25505 16-51)

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N75-25581*# Kanner (Leo) Associates, Redwood City, Calif.
TWO IN SPACE
Ya. Golovanov Washington NASA May 1975 7 p Transl. into ENGLISH from Komsomolskaya Pravda (USSR), 4 Feb. 1975 p 4
(Contract NASw-2481)
(NASA-TT-F-16325) Avail: NTIS HC $3.25 CSCL 05E

The psychological preparation, testing and analysis of cosmonauts is briefly described. The importance of psychological preparation, especially during longer flights, is stressed. Cosmonauts are under observation from the beginning of the training period; their behavior patterns in grasping a new situation are determined. The interrelationship of the Soyuz-II crew members (who died during reentry) and the Soyuz-14 crew is mentioned, and the sound psychological preparation of Cosmonauts Gubarev and Grechko is pointed out. In both Gubarev's and Grechko's psychological profiles, accurate self-conception, and high levels of interiorization and neuropsychological tolerance are noted.
Author

N75-25582*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
VIBRATIONS TRANSMITTED TO HUMAN SUBJECTS THROUGH PASSENGER SEATS AND CONSIDERATIONS OF PASSENGER COMFORT

Jack D. Leatherwood Washington Jun. 1975 56 p refs
(NASA-TN-D-7929; L-9872) Avail: NTIS HC $4.25 CSCL 05S

An experimental study was conducted to determine the vertical and lateral vibration-transmission characteristics of several types of transport vehicle seats (two aircraft and one bus) to obtain preliminary estimates and comparisons of the ride acceptability of the various seat types. Results of this investigation indicate that from the standpoint of human comfort the seats exhibit undesirable dynamic response characteristics. Amplification of floor vibrations occurred at the frequencies known to be most critical for human comfort in both vertical and lateral axes. An average transmissibility function for aircraft seats was tabulated together with the associated variability for use by designers who incorporate similar types of seats in their vehicles. The acceptability of vibrations resulting from floor inputs of 0.10g and 0.15g was low over a broad range of frequencies for both axes and all seat types, and was especially low at frequencies where the input was being amplified. Author

N75-25583# Institute for Defense Analyses, Arlington, Va.
TRAINING OF US AIR TRAFFIC CONTROLLERS Final Report
James H. Henry, Murray E. Kamrass, Jesse Orlansky, Thomas C. Rowan, Joseph String, and R. E. Reichenbach Jan. 1975 279 p refs
(Contract FA-74-WAI-446)
(AD-A006603/5; R-206) Avail: NTIS HC $8.75 CSCL 05/9

The evolution of national programs for air traffic controller training are reviewed and controller selection and training programs are examined, along with methods available to measure performance and to establish competence on the job. The role of standardization and quality control is then addressed. The capabilities and limitations of existing simulation devices for air traffic control training are considered. Alternative ways of meeting the training needs of developmentals are identified and compared on a cost basis. Attention is given to (a) simulators and centralized and noncentralized training, (b) the training budget, (c) future requirements of training, (d) R and D for training, (e) hiring practices, (f) standardization, and (g) the training load at the FAA Academy. GRA

N75-25584# Virginia Polytechnic Inst. and State Univ., Blacksburg.
VISUAL SEARCH AND IMAGE QUALITY Interim Report, 15 Jun. 1971 - 15 Mar. 1973
Harry L. Snyder, Robin Keesee, William S. Beamon, and James R. Aschenbach Oct. 1974 126 p refs
(Contract F33615-71-C-1739; AF Proj. 7183)
(AD-A008007; AMRL-TR-73-114) Avail: NTIS CSCL 05/5

Several experiments were conducted to evaluate alternate unitary measures of video line-scan system image quality. A metric based upon the Modulation Transfer Function of the imaging system was derived, with emphasis placed upon the photometric properties of the system. This metric was shown to predict well the average effects of several imaging system parameters upon the ability of observers to extract information from both dynamic and static images. In attempting to predict the ability of observers to acquire specific targets in an air-to-ground search task; however, other target and background parameters become very important, and such image quality measures must therefore be refined. Relationships among alternate measures of line-scan image quality were discussed, and a conceptual model was presented for combining system noise, raster interference, scene content, and the visual requirements of the observer. GRA

N75-25585# BioTechnology, Inc., Falls Church, Va.
A REVIEW OF RECENT LITERATURE: MEASUREMENT AND PREDICTION OF OPERATIONAL FATIGUE Final Report
Vita West and James F. Parker, Jr. Feb. 1975 80 p refs
(Contract N00014-74-C-0225; NR Proj. 201-067)
(AD-A008405) Avail: NTIS CSCL 06/19

The report presents an overview, and selected bibliography, of recent research dealing with the measurement and prediction of fatigue and stress. The impetus for this review is the need by military medical personnel for procedures which might be used to evaluate operational fatigue during periods of sustained operations. Of most interest are those techniques which can ultimately be easily implemented in a field setting. Two broad lines of investigation are being followed in current stress research. Investigators are generally attempting to identify either neurosensory or biochemical correlates of fatigue. Fatigue studies have failed to demonstrate conclusively a high positive correlation between subjective fatigue and work decrement. Performance can be maintained, within certain limits, in spite of limited sleep and high subjective fatigue. GRA

N75-25586# Human Resources Research Organization, Alexandria, Va.
A REPORT OF HumRRO ACTIVITIES IN SUPPORT OF PROJECT HITVAL
Robert D. Baldwin, Albert L. Kubala, Robert Foskett, J., and Leo C. Benson Jan. 1975 66 p
(Contract DAAD05-73-C-0510)
(AD-A008277; HumRRO-RP-WD(TX)-75-3) Avail: NTIS CSCL 05/9

The report describes activities dealing with human factors principles in the preparation and conduct of HITVAL, a Department of Defense field test evaluating the effectiveness of selected antiaircraft gun systems. The test evaluated hit probabilities for four types of non-U.S. antiaircraft guns firing and fixed and rotary wing aircraft. A task analysis was conducted of the crew positions of each gun system, providing a basis for determining the basic psychological skills and the visual and psychomotor skills required for each duty position. Tests were obtained or designed to test individual skills, and questionnaires were designed to obtain self ratings, peer ratings and supervisor ratings of motivation and morale factors. To assist in assigning the crews for the field test, psychological abilities of each potential crewman were compared with the skills judged to be critical for successful performance of each duty position. GRA

N75-25587# Design Plus, St. Louis, Mo.
BEHAVIORAL TAXONOMY OF UNDERGRADUATE PILOT TRAINING TASKS AND SKILLS: TAXONOMY REFINEMENT, VALIDATION AND OPERATIONS, PHASE 2 Interim Report, Nov. 1973 - May 1974
Robert P. Meyer, Jack I. Laveson, Neal S. Weissman, and Edward E. Eddowes Dec. 1964 215 p refs
(Contract F41609-73-C-0040; AF Proj. 1123)
(AD-A008201; AFHRL-TR-74-33(III)) Avail: NTIS CSCL 05/9

The objective is to analyze and specify the fundamental flying abilities which comprise the training objectives of Undergraduate Pilot Training (UPT). The results of this study will be used as a basis for structuring research on and recommendations for improvements in Air Force flying training programs. The flight training maneuvers of UPT were analyzed according to a breakdown of task elements into the cues, mental actions and motor actions required to accomplish them. Flying tasks analyzed were found to fall into three categories: fundamental transitions, composite transitions and continuous transitions. A set of classification rules were developed to locate any flying training task element in a specific pigeon hole within a taxonomic cubic structure with a cue, motor actions and mental actions serving respectively as the vertical, horizontal and depth axes of the cube. During this phase of the study, 22 additional flight tasks were analyzed supplementing the 14 tasks analyzed previously. All the tasks analyzed were classified and the resulting skill data were further categorized according to a hierarchy of taxonomic rules. The taxonomic hierarchy was adapted to a matrix system of information categorization which was found to provide for simplified data retrieval. GRA

N75-25588# Deutsche Gesellschaft fuer Luft- und Raumfahrt, Cologne (West Germany).
BEHAVIORAL MODELS OF THE PILOT
1974 104 p refs In GERMAN; ENGLISH summaries Proc. of the 15th Meeting of the DGLR Comm. on Human Factors Eng., Meckenheim, West Ger., 18 Apr. 1974
(DLR-Mitt-74-42) Avail: NTIS HC $5.25; DFVLR, Porz, West Ger. DM 43.50

Topics in the field of behavioral models of human operators are dealt with. The application of the algorithm theory to derive a behavioral model for a flight control and safety operator is considered. A survey is given of various approaches to the description of pilot control behavior. The necessity for time variance was investigated for behavioral models, and several limits of validity of these models were examined. A literature study of several physiological stress models, based on various theories, is presented. For individual titles, see N75-25589 through N75-25593.

N75-25589 Technische Hochschule, Darmstadt (West Germany). Inst. fuer Arbeitswissenschaft.
ALGORITHM-THEORETICAL BEHAVIORAL MODEL FOR FLIGHT CONTROL AND FLIGHT SAFETY ACTIVITIES [ALGORITHMENTHEORETISCHES VERHALTENSMODELL FUER FLUGFUEHRUNGS- UND FLUGSICHERUNGSTAETIGKEITEN]
H. D. Reiche *In* DGLR Behavioral Models of the Pilot 1974 p 7-15 refs In GERMAN (For availability see N75-25588 16-53)

The application of the algorithm theory to derive a behavioral model for a flight control and safety operator is discussed. In order to obtain such a model the following limiting criteria in the operation are considered: a complete alphabet of operations and logical conditions is produced to allow algorithmic representation of the tasks; all operations and conditions need to be unambiguously defined, and the execution of each operation should be unambiguous; and the operator should know the operations and conditions in the alphabet. The possibilities of this model within these restrictions are examined. ESRO

N75-25590 Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
TWO ASPECTS OF FEEDBACK CONTROL PILOT DESCRIPTIONS: VALIDITY RANGE AND MODEL EVALUATION [ZWEI ASPEKTE REGELUNGSTECHNISCHER PILOTENBESCHREIBUNGEN: GUELTIGKEITSBEREICH UND BEURTEILUNG DER MODELLIERUNG]
W. Stein *In* DGLR Behavioral Models of the Pilot 1974 p 17-38 refs In GERMAN; ENGLISH summary (For availability see N75-25588 16-53)

Various approaches to the description of pilot control behavior are surveyed, including some aspects of requirements and applications. A set of experiments is described using a single axis manual control with elementary control loops and stationary, stochastic forcing functions as a simple control example that can easily be modeled. A selection of previous quasi-linear operator behavior descriptions as well as current experimental results are summarized and compared. The variability of transfer characteristics and the model errors obtained are described so that the validity of the approach in application to other and more complex models can be assessed. Author (ESRO)

N75-25591 Technische Hochschule, Darmstadt (West Germany). Inst. fuer Arbeitswissenschaft.
CONCEPT OF A FEEDBACK CONTROL BEHAVIORAL MODEL FOR PHYSIOLOGICAL ASPECTS OF VEHICLE GUIDANCE
E. Haider and H. Luczak *In* DGLR Behavioral Models of the Pilot 1974 p 39-52 refs In GERMAN; ENGLISH summary (For availability see N75-25588 16-53)

The necessity for time variance was investigated for behavioral models of operators. A multidimensional physiological method is presented to describe the transformation in time, and is validated in a simulated vehicle driving task. A time variant model for the human operator was developed based on results of analyses of physiological time series, and was simulated on a digital computer. ESRO

N75-25592 Technische Universitaet, Munich (West Germany). Inst. fuer Arbeitsphysiologie.
CONTROL PERFORMANCE BEHAVIOR IN PURSUIT TRACKING DURING THE LEARNING PHASE UNDER MASSED AND DISTRIBUTED PRACTICE CONDITIONS, INCREASED MOTIVATION BY ADDITIONAL FINANCIAL INCENTIVE, AND AFTER CHANGE OF THE CONTROL ELEMENT PARAMETERS [REGELLEISTUNGSVERHALTEN BEI PURSUIT TRACKING WAEHREND DER ANLERNPHASE UNTER MASSIERTEN UND VERTEILTEN UEBUNGSBEDINGUNGEN, ERHOEHTER MOTIVATION DURCH ZUSAETZLICHE MONETAERE ANREIZE UND NACH DER AENDERUNG VON KENNGROESSEN DES BEDIENELEMENTS]
Helmut Strasser and Alon Adler *In* DGLR Behavioral Models of the Pilot 1974 p 53-66 refs In GERMAN (For availability see N75-25588 16-53)

Several limits of the validity of behavioral models were examined. The effects of learning curves for various input signals of constant and quasi-constant difficulty coefficients, and adaptive progressive and regressive varying input frequencies are pointed out. The effects of several financial incentives, distributed and massed practice, a placebo, and the variation of the characteristics of the control element for positional control were measured. The results underline the hypothesis that adaptively varying control characteristics, and increased motivation lead to the human being going to the limit of his performance. ESRO

N75-25593 Technische Hochschule, Darmstadt (West Germany). Inst. fuer Arbeitswissenschaft.
STRESS MODELS [BELASTUNGSMODELLE]
H. Luczak *In* DGLR Behavioral Models of the Pilot 1974 p 67-95 refs In GERMAN (For availability see N75-25588 16-53)

A literature study of several physiological stress models, based on various theories, is presented. ESRO

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N75-25594*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
IODINE GENERATOR FOR RECLAIMED WATER PURIFICATION Patent Application
Richard A. Wynveen (Life Systems, Inc., Cleveland), James D. Powell (Life Systems, Inc., Cleveland), and Franz H. Schubert, inventors (to NASA) (Life Systems, Inc., Cleveland) Filed 25 Apr. 1975 13 p
(Contract NAS1-11765)
(NASA-Case-MSC-14632-1; US-Patent-Appl-SN-571459) Avail: NTIS HC $3.25 CSCL 06K

An electro-chemical iodine valve was designed to be operated by an electrical current in response to detection of iodine levels in the water supply. Additional iodine is injected into the water system in precise and controlled amounts so that a preset residual concentration of iodine in the water supply may be maintained. The iodine generator includes a sensor which electronically detects the iodine level in the water, and produces a correction current control. The correction current control causes the electro-chemical iodine valve to release iodine from the iodine accumulator into the iodine dispenser. The valve operates at a power of 10 mWatts and the system uses recycled water. NASA

N75-25595*# Kanner (Leo) Associates, Redwood City, Calif.
THE SPACE KITCHEN: DISCUSSIONS BETWEEN SCIENTISTS AND READERS
Ya. Gorokhovatskiy Washington NASA May 1975 7 p Transl. into ENGLISH from the book "Kosmicheskaya kukhnya: Besedy uchonykh s chitatelyami" Pravda, 5 Feb. 1975, p 2
(Contract NASw-2481)
(NASA-TT-F-16322) Avail: NTIS HC $3.25 CSCL 06H

Water and food regeneration in closed cycle life support systems for long duration space flights are discussed. A water regeneration system has already been developed and tested; three subjects lived one year on regenerated water. However, a food regeneration system has not yet been developed. Various possible processes are suggested for transforming the carbon dioxide, hydrogen and oxygen available in a spacecraft into edible carbohydrates. The main problem is implementation of the reaction of formaldehyde condensation into carbohydrates which could be assimilated by the body. Author

N75-25596*# Minnesota Univ., Minneapolis. Space Science Center.

ENVIRONMENTAL MICROBIOLOGY AS RELATED TO PLANETARY QUARANTINE Semiannual Progress Report
Irving J. Pflug Dec. 1974 59 p refs
(Grant NGL-24-005-160)
(NASA-CR-142933; SAPR-13) Avail: NTIS HC $4.25 CSCL 06M

Continued experimental work related to dry heat resistance of microorganisms. One phase of this research has been concerned with the viability and dry heat resistance of indigenous microflora associated with small soil particles. The second part of this report is an analysis of the present status of dry heat sterilization. An attempt is made to integrate results for both laboratory grown spores and spores in soil. Author

N75-25597*# Scientific Translation Service, Santa Barbara, Calif.
THE HOUSE IN ORBIT
I. Chesanova Washington NASA 12 Jun. 1975 9 p Transl. into ENGLISH from Leningr. Pravda (Leningrad), 31 Dec. 1974 p 2
(Contract NASw-2483)
(NASA-TT-F-16328) Avail: NTIS HC $3.25 CSCL 06K

The automatic life support system on biosatellites Cosmos 605 and Cosmos 690 is described. White rats in both satellites were housed in individual two-level houses about the size of the average transistor radio. The animal lived in the upper level, while the lower was used for automatic waste collection. Each compartment had a circuit acting as an induction coil to register the animal's movements. Ventilation, food, and water (every 6 hours), and light (from 8:00 - 16:00 hours) were automatically provided. If the animal showed no movement for 24 hours, services were stopped and its compartment was hermetically sealed. A special switch control unit directed the equipment; a total of 22,000 commands were given for Cosmos 605. Cosmos 690 design was basically the same; however, since the effect of radiation in weightlessness was being studied, an artificial radiation source was installed. Author

N75-25598*# National Aeronautics and Space Administration. Pasadena Office, Calif.
CATHETER TIP FORCE TRANSDUCER FOR CARDIOVASCULAR RESEARCH Patent Application
Cyril Feldstein (JPL), Gilbert W. Lewis (JPL), Robert H. Silver (JPL), and Virgil H. Culler, inventors (to NASA) (JPL) Filed 16 May 1975 11 p
(Contract NAS7-100)
(NASA-Case-NPO-13643-1; US-Patent-Appl-SN-578241) Avail: NTIS HC $3.25 CSCL 06B

A force transducer for measuring dynamic force activity within the heart of a subject essentially consisting of a U-shaped beam of low elastic compliance material is proposed. Two tines extend from the beam's legs and a long coil spring is attached to the beam. A strain gauge is coupled to one of the beam's legs to sense deflections thereof. The beam with the tines and most of the spring are surrounded by a flexible tube, defining a catheter, which is insertable into a subject's heart through an appropriate artery. The tines are extractable from the catheter for implantation into the myocardium by pushing on the end of the spring which extends beyond the external end of the catheter. The tines are retractable back into the catheter, prior to catheter removal from the subject, by pulling on the externally exposed spring end. NASA

N75-25599*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB VECTORCARDIOGRAPH: SYSTEM DESCRIPTION AND IN FLIGHT OPERATION
John Lintott and Martin J. Costello (Martin Marietta Corp., Denver, Colo.) Washington Jun. 1975 20 p refs
(NASA-TN-D-7997; JSC-S-437) Avail: NTIS HC $3.25 CSCL 06B

A vectorcardiograph system was used to measure cardiac electrical activity of Skylab crewmen. This system was chosen because of its data-quantification advantages. The vectorcardiograph was required to meet recommended American Heart Association specifications, to withstand space environmental extremes, and to facilitate data gathering in the weightless environment. The vectorcardiograph system performed without failure, and all projected data were acquired. The appendix lists the design specifications used for the Skylab vectorcardiograph system. Author

N75-25600# Atomic Energy Commission, Washington, D.C.
DRAFT GENERIC ENVIRONMENTAL STATEMENT ON THE WIDE-SCALE USE OF PLUTONIUM POWERED CARDIAC PACEMAKERS
Jan. 1975 202 p refs
(TID-26718) Avail: NTIS HC $7.25

Nuclear-powered cardiac pacemakers were developed which use plutonium (primarily the Pu-238 isotope) as a heat source in a thermoelectric converter battery. The relatively long half-life of Pu--238 (87.8 y) provides batteries with longer service life than conventional batteries, and reduces the need for pacemaker reimplantations, thus reducing the surgical risk, pain, suffering, and anxiety associated with replacement surgery. This environmental impact statement considers the radiation safety standards which nuclear pacemakers are required to meet, the benefits to patients from the longer useful life of nuclear powered pacemakers, alternative pacemakers that are available or being developed, and the risks to the public and to the environment from the use of plutonium powered pacemakers. NSA

N75-25601# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
LABORATORY VIBRATION SCHEDULES Common Test Operations Procedures
20 Mar. 1975 29 p refs Revised
(AD-A008234; TOP-1-2-601) Avail: NTIS CSCL 15/5

Provides schedules for conducting laboratory vibration tests of Army materiel and discusses selection of schedules. Covers simulated logistical transportation of secured cargo and tactical transportation of equipment installed in ground vehicles and helicopters and mounted externally on helicopters. Schedules include vibration levels, frequencies, and test time for various simulations. GRA

N75-25602# Army Natick Labs., Mass. Clothing Equipment and Materials Engineering Lab.
LAMINATES FOR BALLISTIC PROTECTION Technical Report, Jul. - Dec. 1974
Roy C. Laible and Maurice R. Denommee Feb. 1975 16 p refs
(DA Proj. 1T7-62723-AH-98)
(AD-A008020; CE/MEL-140; USA-NLABS-TR-75-76-CE) Avail: NTIS CSCL 19/4

Kevlar 29 and fiberglass laminates were ballistically evaluated with 9 mm projectiles to determine their ability to protect against severe hand gun threats. The Kevlar laminates exhibit an advantage over the glass laminates, providing complete protection against 9 mm projectiles up to 395 m/sec at an areal density of 7.3 kg/square meter. The glass laminates allowed some complete penetrations even at a higher areal density. GRA

N75-25603# Computer Corp. of America, Cambridge, Mass.
BIOCYBERNETICS PROJECT Final Report, 30 Jun. 1973 - 31 Dec. 1974
Jeffrey M. Hill 31 Dec. 1974 21 p refs
(Contract DAHC15-73-C-0320)
(AD-A008209) Avail: NTIS CSCL 06/4

CCA's biocybernetics effort had two major parts: support of the ARPA biocybernetics community and a research program focusing on EEG correlates of attention. In the area of cybernetics community support, CCA has funded a successful pilot effort to share data and analysis tools using the ARPA network. In its own research, CCA has demonstrated the feasibility of using evoked potential experiments to study a model of human learning. GRA

N75-25546 Medical Physics Inst. Utrecht (Netherlands).
VACUUM DELATENCY CASTING FOR THE CONSTRUCTION OF INDIVIDUALLY MOLDED SEATS
F. H. Germans, M. W. Koster, H. H. Kwee, N. VdMey, R. Soerjanto, and D. W. Wijkmans *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 23-29 refs
(For availability see N75-25543 16-52)

N75-25548 Medical Physics Inst. Utrecht (Netherlands).
THE CARDIAC OUTPUT COMPUTER (COC) PROJECT
K. H. Wesseling, B. DeWit, J. A. P. Weber, and J. E. W. Beneken *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 44-50 refs (For availability see N75-25543 16-52)

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

N75-25604*# National Aeronautics and Space Administration, Washington, D.C.
OBJECTIVES AND MODELS OF THE PLANETARY QUARANTINE PROGRAM
Morton Werber 1975 140 p refs
(NASA-SP-344; LC-74-600023) Avail: NTIS MF $2.25; SOD HC $2.10 CSCL 06C

The objectives of the planetary quarantine program are presented and the history of early contamination prevention efforts is outlined. Contamination models which were previously established are given and include: determination of parameters; symbol nomenclature; and calculations of contamination and hazard probabilities. Planetary quarantine is discussed as an issue of national and international concern. Information on international treaty and meetings on spacecraft sterilization,quarantine standards, and policies is provided. The specific contamination probabilities of the U.S.S.R. Venus 3 flyby are included. L.B.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N75-25605*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INTEGRATING TV/DIGITAL DATA SPECTROGRAPH SYSTEM
B. J. Duncan, T. D. Fay (Ala. Univ., Tuscaloosa), E. R. Miller, W. Wamsteker, R. M. Brown (Computer Sci. Corp., Huntsville, Ala.), and P. L. Neely (Computer Sci. Corp., Huntsville, Ala.) 15 Apr. 1975 19 p refs
(NASA-TM-X-64931) Avail: NTIS HC $3.25 CSCL 09B

A 25-mm vidicon camera was previously modified to allow operation in an integration mode for low-light-level astronomical work. The camera was then mated to a low-dispersion spectrograph for obtaining spectral information in the 400 to 750 nm range. A high speed digital video image system was utilized to digitize the analog video signal, place the information directly into computer-type memory, and record data on digital magnetic tape for permanent storage and subsequent analysis. Author

N75-25606# Australian Post Office Research Labs., Melbourne.
A PROGRAM FOR DIGITIZED RECORDING OF ANALOGUE INFORMATION
P. J. Tyers Jul. 1974 55 p refs
(Rept-6864) Avail: NTIS HC $4.25

A program is described which has possible application in sampling of analog information and recording it in digitized form on magnetic tape. This program was originally designed to sample conversations at a rate of 7 kHz and record them in digitized form or on magnetic tape for later analysis. Author

N75-25607# Mitre Corp., Bedford, Mass.
REMOTE-TERMINAL EMULATOR (DESIGN VERIFICATION MODEL); SCENARIO INTERPRETER, VOLUME 5
D. L. James Nov. 1974 226 p
(Contract F19628-73-C-0001)
(AD-A003412; MTR-2677-Vol-5; ESD-TR-74-198) Avail: NTIS CSCL 09/2

The Remote-Terminal Emulator is a minicomputer-based system which generates message traffic for use in testing and evaluating large-scale multi-terminal computer systems. This series of reports describes the two Design Verification Models that were developed on Data General NOVA 800 minicomputers. This volume describes the Scenario Interpreter--the real-time, emulator application program which operates in conjunction with the Real-Time Exec, a multi-tasking, application-oriented executive program. The Scenario Interpreter executes commands used to exert gross control over the run, executes scenarios which describe the actions to be taken in emulating terminal and operator functions, and records real-time events on a log tape. GRA

N75-25608# University of Southern Calif., Marina del Rey. Information Sciences Inst.
A COMMAND LANGUAGE PROCESSOR FOR FLEXIBLE INTERFACE DESIGN
Russell J. Abbott Sep. 1974 68 p refs
(Contract DAHC15-72-C-0308; ARPA Order 2223/1)
(AD-A008153; ISI/RR-74-24) Avail: NTIS CSCL 09/2

A functional specification for a computer-based, interactive Command Language Processor (CLP) is presented. The CLP is the language processing component of a user-oriented interface (called the Agent) to a sophisticated, text preparation and message processing service. The CLP differs from most language processors in that it operates with a dialogue grammar and takes the entire interaction between user and Agent as its source parse string. The parse is ongoing and proceeds along with the interaction. Within this framework, the CLP provides: pronominal referencing, situation dependent prompts and, on request, a contextual review of the entire interaction. As the user and Agent interact, the CLP develops a lexicon of the user's name space. Using that lexicon, the CLP recognizes abbreviated and incompletely spelled words. A facility is provided to define macro commands presented in example form by the user. GRA

N75-25609# Texas Instruments, Inc., Dallas. Equipment Group.
DESIGN OF THE CORE ELEMENTS OF THE DIGITAL AVIONICS INFORMATION SYSTEM, VOLUME 2 Final Report, 19 Nov. 1973 - 1 Jun. 1974
Leo A. Chamberlin, Jim Early, Ted Falconer, Vytas Gylys, and Jim Hinderer 18 Nov. 1974 482 p 3 Vol.
(Contract F33615-74-C-1023)
(AD-A008008; AFAL-TR-74-245-Vol-2) Avail: NTIS CSCL 09/2

This final technical report presents the design of the Core Elements of Digital Avionics Information System (DAIS). The report is in 10 sections, one for each of the major tasks defined in the contract statement of work. The report is divided into three volumes with each volume containing the following sections: Volume II--Control and Display, Software and Processor, Flight Control, Hot Bench Design, Sensor Recommendations. GRA

N75-25610# Texas Instruments, Inc., Dallas. Equipment Group.
DESIGN OF THE CORE ELEMENTS OF THE DIGITAL AVIONICS INFORMATION SYSTEM, VOLUME 3 Final Report, 19 Nov. 1973 - 1 Jun. 1974
Leo A. Chamberlin, Jim Early, Ted Falconer, Vytas Gylys, and Jim Hinderer 18 Nov. 1974 353 p 3 Vol.
(Contract F33615-74-C-1023)
(AD-A008009; AFAL-TR-74-245-Vol-3) Avail: NTIS CSCL 09/2

This final technical report presents the design of the Core Elements of Digital Avionics Information System (DAIS). The report is in 10 sections, one for each of the major tasks defined in the contract statement of work. The report is divided into three volumes with each volume containing the following sections: Volume III--APPENDIX; DAIS Signal Summary List. GRA

N75-25611# Ohio State Univ., Columbus. Div. of Statistics.

IRCCRAND, THE OHIO STATE UNIVERSITY RANDOM NUMBER GENERATOR PACKAGE

Edward J. Dudewicz Oct. 1974 100 p refs
(Grant DA-ARO(D)-31-124-72-G55)
(AD-A008429; TR-104) Avail: NTIS CSCL 09/2

A documented package (IRCCRAND) of random (pseudo-random) number generators for use in simulation and Monte Carlo studies is presented. The documentation is intended to allow intelligent choice of a random number generator by most investigators using simulation methodology. GRA

N75-25612# University of Southern Calif., Marina del Rey. Information Sciences Inst.

MODELING CONSIDERATIONS IN COMPUTER COMMUNICATION RESOURCE CONTROL

Stephen R. Kimbleton Jan. 1975 16 p refs
(Contracts N00014-67-A-0181-0036; DAHC15-72-C-0308; ARPA Order 2223/1; NR Proj. 049-311)
(AD-A008238) Avail: NTIS CSCL 09/2

Effective use of mission oriented networks requires coordination and control of both communication and computer facilities. Achievement of these capabilities is shown to require a means for prediction of the effects of network modifications upon network performance. It is observed that standard monolithic simulation approaches are unlikely to provide an effective means for network performance prediction and the feasibility of developing a suitable structured analytically driven approach is explored. GRA

N75-25613# Naval Air Development Center, Warminster, Pa. Systems Analysis and Engineering Dept.

LAMPS: A CASE HISTORY OF PROBLEMS/DESIGN OBJECTIVES FOR AN AIRBORNE DATA HANDLING SUBSYSTEM

Howard J. Cattie, Jr. and Rex Reed 30 May 1974 24 p refs
(AD-A008154; NADC-CS-74201-50) Avail: NTIS CSCL 09/2

The paper is presented to clarify and broaden understanding of the problems relating to computer-based real-time systems. A current U.S. Navy Avionics Data Handling Subsystem aboard a destroyer-based helicopter, will be reviewed as it progressed from the concept evaluation and flight test phases of an engineering test bed, to the present engineering prototype. An analysis of the test bed's positive and negative data handling features are discussed with respect to their influence on the follow-on design. The prevailing philosophies and constraints surrounding such a development impacts the design alternatives while a balancing of hardware/software parameters assists in optimizing system performance. GRA

N75-25614# Naval Research Lab., Washington, D.C.

MICROPROGRAMMED BENCH MARKS FOR THE SIGNAL PROCESSING ARITHMETIC UNIT OF THE AN/UYK-17 XB-1 V SIGNAL PROCESSING ELEMENT Interim Report

Harold H. Smith and Leonard E. Russo 29 Jan. 1975 76 p refs
(AD-A008144; NRL-7831) Avail: NTIS CSCL 09/2

The AN/UYK-17(XB-1)(V) Signal Processing Element uses a Signal Processing Arithmetic Unit (SPAU) to execute subroutines that involve extensive arithmetic operations. Five benchmark programs were written for an early model of the SPAU and run on a simulator. As a result of coding and executing these programs, several changes were made to the SPAU design. GRA

N75-25615# Naval Underwater Systems Center, Newport, R.I.

FUNCTIONAL DESCRIPTION OF AN AUTOMATED CONFIGURATION MANAGEMENT INFORMATION SYSTEM

David A. Cobb 11 Feb. 1975 44 p
(AD-A008336; NUSC-TD-4602) Avail: NTIS CSCL 09/2

The capabilities of the existing computerized configuration management information system are specified. The system is viewed as it appears to the user: a set of report products in response to the informational needs of the users. GRA

N75-25616# Massachusetts Computer Associates, Inc., Wakefield.

DEVELOPMENT OF THEORETICAL FOUNDATIONS FOR DESCRIPTION AND ANALYSIS OF DISCRETE INFORMATION SYSTEMS Semiannual Technical Report, 1 Dec. 1973 - 31 Mar. 1975

14 Mar. 1975 209 p refs Sponsored by ARPA
(AD-A008385; CADD-7503-1411; SATR-2) Avail: NTIS CSCL 09/2

Contents: Role/activity models and Petri nets; Role-activity nets in the analysis of a financial information system; The connection of parts to one another in system contexts; Definitions pertaining to Petri nets, states and events and behavior; Calculating logical and probabilistic dependencies in a class of net models; System modeling with net structures; On periodic solutions of affine recurrence systems; Communication mechanics. GRA

N75-25617# Texas Univ., Austin. Center for Cybernetic Studies.

NONBASIC BRANCHING AND DUAL RELAXATION IN A BRANCH-AND-BOUND MIXED INTEGER PROGRAMMING ALGORITHM

Ronald D. Armstrong Feb. 1975 22 p refs
(Contract N00014-67-A-0126-0009; NR Proj. 047-021)
(AD-A008361; CCS-215) Avail: NTIS CSCL 12/2

This paper presents branch-and-bound linear mixed integer algorithms which employ nonbasic branching and/or a form of dual relaxation in order to attain the objective function change prescribed by a bound more rapidly than in the standard algorithm. The subproblems arising from the algorithms may at times be solved with no computation or their solution may result in simplex tableaus which are both primal and dual infeasible. Procedures to allow for recovery from dual infeasibility and branching criteria which guarantee optimality will be described. Sample problems will be solved and comparisons made between the specified algorithms. GRA

N75-25618# Chemical Abstracts Service, Columbus, Ohio.

APS-73 CROSS-ASSEMBLER SOFTWARE INCLUDING INIT AND SHELLSRT

Apr. 1974 39 p
(Contract NSF C-656)
(PB-238822/1) Avail: NTIS HC $3.75 CSCL 09B

The APS-73 Cross Assembler assembles APS-73 symbolic code on the 370. It outputs an assembly listing and a source module on magnetic tape for input to the APS-73 assembler on the AOS-4. (NOTE: The APS-73 is Autologic's mini-computer designed to replace the DATA-MATE-70. They are compatible in functions and programming language). Also included is the SHELLSRT module and the INIT macro. INIT is executed to save coding and keypunching in initializing a program module according to standards. SHELLSRT is an internal sort module using the merge/exchange method. GRA

N75-25619# Illinois Univ., Urbana. Dept. of Computer Science.

AN INTERACTIVE ANALYSIS SYSTEM FOR EXECUTION TIME ERRORS Ph.D. Thesis

Alan Mark Davis Jan. 1975 107 p refs
(Grant NSF EC-41511)
(PB-239748/7; UIUCDCS-R-75-695) Avail: NTIS HC $5.25 CSCL 09B

The interactive analysis system for execution-time errors is designed for use in introductory computer programming courses. Its purpose is to provide the facility to have execution-time errors in higher-level programs automatically analyzed so as to find the actual cause for the errors. It is written in the TUTOR language of the PLATO computer-assisted instruction system. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N75-25620*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DYNGEN: A PROGRAM FOR CALCULATING STEADY-STATE AND TRANSIENT PERFORMANCE OF TURBOJET AND TURBOFAN ENGINES
James F. Sellers and Carl J. Daniele Washington Apr. 1975 202 p refs
(NASA-TN-D-7901; E-8111) Avail: NTIS HC $7.25 CSCL 09B

The DYNGEN, a digital computer program for analyzing the steady state and transient performance of turbojet and turbofan engines, is described. The DYNGEN is based on earlier computer codes (SMOTE, GENENG, and GENENG 2) which are capable of calculating the steady state performance of turbojet and turbofan engines at design and off-design operating conditions. The DYNGEN has the combined capabilities of GENENG and GENENG 2 for calculating steady state performance; to these the further capability for calculating transient performance was added. The DYNGEN can be used to analyze one- and two-spool turbojet engines or two- and three-spool turbofan engines without modification to the basic program. A modified Euler method is used by DYNGEN to solve the differential equations which model the dynamics of the engine. This new method frees the programmer from having to minimize the number of equations which require iterative solution. As a result, some of the approximations normally used in transient engine simulations can be eliminated. This tends to produce better agreement when answers are compared with those from purely steady state simulations. The modified Euler method also permits the user to specify large time steps (about 0.10 sec) to be used in the solution of the differential equations. This saves computer execution time when long transients are run. Examples of the use of the program are included, and program results are compared with those from an existing hybrid-computer simulation of a two-spool turbofan. Author

N75-25621*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
A FORTRAN PROGRAM FOR DETERMINING AIRCRAFT STABILITY AND CONTROL DERIVATIVES FROM FLIGHT DATA
Richard E. Maine and Kenneth W. Iliff Washington Apr. 1975 177 p refs
(NASA-TN-D-7831; H-856) Avail: NTIS HC $7.00 CSCL 09B

A digital computer program written in FORTRAN IV for the estimation of aircraft stability and control derivatives is presented. The program uses a maximum likelihood estimation method, and two associated programs for routine, related data handling are also included. The three programs form a package that can be used by relatively inexperienced personnel to process large amounts of data with a minimum of manpower. This package was used to successfully analyze 1500 maneuvers on 20 aircraft, and is designed to be used without modification on as many types of computers as feasible. Program listings and sample check cases are included. Author

N75-25622*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A DIGITAL COMPUTER SIMULATION AND STUDY OF A DIRECT-ENERGY-TRANSFER POWER-CONDITIONING SYSTEM
William W. Burns, III (Duke Univ.), Harry A. Owen, Jr. (Duke Univ.), Thomas G. Wilson (Duke Univ.), G. Ernest Rodriguez, and John Paulkovich [1974] 12 p Prepared in part by Duke Univ.
(Grant NGL-34-001-001)
(NASA-TM-X-66859) Avail: NTIS HC $3.25 CSCL 09B

A digital computer simulation technique, which can be used to study such composite power-conditioning systems, was applied to a spacecraft direct-energy-transfer power-processing system. The results obtained duplicate actual system performance with considerable accuracy. The validity of the approach and its usefulness in studying various aspects of system performance such as steady-state characteristics and transient responses to severely varying operating conditions are demonstrated experimentally. Author

N75-25623*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
USER'S MANUAL FOR A PARAMETER IDENTIFICATION TECHNIQUE
Gerd Kanning Mar. 1975 200 p refs
(NASA-TM-X-62386; A-5752) Avail: NTIS HC $7.00 CSCL 09B

A digital computer program written in FORTRAN is presented that implements the system identification theory for determininistic systems using input-output measurements. The user supplies programs simulating the mathematical model of the physical plant whose parameters are to be identified. The user may choose any one of three options. The first option allows for a complete model simulation for fixed input forcing functions. The second option identifies up to 36 parameters of the model from wind tunnel or flight measurements. The third option performs a sensitivity analysis for up to 36 parameters. The use of each option is illustrated with an example using input-output measurements for a helicopter rotor tested in a wind tunnel. Author

N75-25624# Royal Aircraft Establishment, Farnborough (England).
RECOVERY: A COMPUTER PROGRAM TO RESTORE FILES FROM DUMP TAPES PRODUCED BY GEORGE 3 OPERATING SYSTEM
G. Sharples Nov. 1973 39 p refs
(RAE-TM-Math-7307; BR39563) Avail: NTIS HC $3.75

The GEORGE 3 operating system for ICL 1900 computers provides a filestore facility so that information may be stored in a convenient and readily available manner. To ensure the integrity of the filestore contents, a back-up copy is maintained on magnetic tapes which are known as dump tapes. It is possible for users to erase or overwrite files, with the danger that this may be done in error. A program which can restore such lost files (by copying the back-up versions stored on dump tapes) into the filestore is described. Files, although no longer 'Known' to GEORGE 3, will normally persist on old dump tapes for some weeks. A brief description is given of dumping procedures and of the structure of dump tapes. Author (ESRO)

N75-25625# Army Engineer Topographic Labs., Fort Belvoir, Va.
A SYSTEM FOR TOPOGRAPHIC INQUIRY NO. 2 ALPHANUMERIC SUBSYSTEM Final Report, Jul. 1970 - Jul. 1974
Alden Corell Gunther Mar. 1975 104 p refs
(DNA Proj. 4304)
(AD-A008012; ETL-0003) Avail: NTIS CSCL 09/2

The System for Topographic Inquiry (STOPIN)--Alphanumeric Subsystem is an on-line, topographic data system developed to demonstrate the capability to store, retrieve, and disseminate large quantities of non-graphic topographic information. This report describes the assumptions and design criteria employed during the development, outlines the software package developed to implement the data base, and provides a description of each data field including the allowable requests for information. GRA

N75-25626# University of Southern Calif., Marina del Rey. Information Sciences Inst.
WHY THINGS ARE SO BAD FOR THE COMPUTER-NAIVE USER
William C. Mann Mar. 1975 12 p refs
(Contract N00014-75-C-0710; ARPA Order 2930)
(AD-A008457; ISI/RR-75-32) Avail: NTIS CSCL 09/2

Many people who use computers, or have tried to use them, find them extremely difficult to master, understand, interact with. Computers have a well-earned reputation for alienness and intractability. Much of the difficulty arises from the prevailing ways that computer programs communicate with people. Computer professionals have been preoccupied with commands and command languages, to the exclusion of the kinds of communication that people use most of the time with each other. To make use of a computer, people are forced into an unfamiliar command-oriented organization, and many cannot make this extreme transition. By expanding the scope of human-computer interaction methods to include other styles of interaction, computer systems can be made more compatible with the computer-naive potential user. This enhanced compatibility will open up new applications in which computer-naive people make direct use of computers to extend their working abilities. This paper identifies the gap between today's dominant styles of person-computer communication and interpersonal communication, and suggests the developments needed to make computers more people-compatible. GRA

N75-25627# Naval Underwater Systems Center, Newport, R.I.
A GRAPHIC DISPLAY SYSTEM FOR INTERACTIVE SIMULATION
Edward A. DeGregorio 3 Feb. 1975 108 p refs
(SF33341407)
(AD-A008157; NUSC-TD-4624) Avail: NTIS CSCL 09/2

This thesis describes the design and implementation of a real-time multiprogrammed operating system that efficiently monitors and controls an interactive graphic simulation system. The system software design for the dynamic man-machine interactive system interfaces the human decision-making process with the computer's data-handling capabilities. For the purposes of this investigation the real-world environment is simulated. The system is implemented on a Honeywell H-316/S50 minicomputer/display configuration. GRA

N75-25628# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
TI 2520 SIMULATOR M.S. Thesis
Henry C. Madison, Jr. Dec. 1974 149 p refs
(AD-A008287; GE/MA-74D-5) Avail: NTIS CSCL 09/2

The thesis provides the Air Force Avionics Laboratory with a simulator for the TI 2520 avionics computer. The simulator was written in a higher order language (FORTRAN) in order to increase the transferability of the simulator as AFAL wished to use the simulator on many different computer systems. The thesis provides the user four features to aid in debugging his programs. First, the user can trace every instruction or only specified instructions. Secondly, he can dump portions of the pseudo-memory. Third, boundaries can be set within the pseudo-memory to allow the user to detect areas from which he is reading or to which he is writing. Finally, a command is promised to allow the user to stop his simulation. GRA

N75-25629# George Washington Univ., Washington, D.C.
OPTIMAL DESIGN OF A CORRUGATED TRANSVERSE BULKHEAD: AN EXAMPLE OF THE USE OF THE FACTORABLE PROGRAMMING LANGUAGE
Garth P. McCormick 31 Jan. 1975 18 p refs
(Contract N00014-67-A-0214-0001; NR Proj. 347-020)
(AD-A008179; Serial-T-313) Avail: NTIS CSCL 12/2

Most optimal engineering design problems involve only factorable functions, those functions which can be decomposed into complicated transformed sums and products of functions of a single variable. A language for nonlinear programming is described based on the concept of factorable functions. The use of the language is explained using a nonlinear programming model of the optimal design of a corrugated transverse bulkhead. GRA

N75-25630# Office of the Chief of Engineers (Army), Washington, D.C. Engineer Studies Group.
REVIEW OF COMPUTER APPLICATIONS AND PROGRAMS (ROCAP)
31 Mar. 1974 191 p refs
(AD-A008015) Avail: NTIS CSCL 09/2

This study reviews the current Automatic Data Processing (ADP) posture of the Corps of Engineers and recommends a course of action that will make the best use of existing resources. Corps ADP is examined to ascertain the goals, resource commitments, and management philosophy that spurred its growth. Data were gathered from questionnaires completed by each Division Engineer and from extensive on-site interviews with all Division ADP coordinators and with numerous branch and office personnel in OCE and DA ADP offices. Contact was established with commercial firms to ascertain equipment improvement ideas and costs. Recommendations were made concerning resolution of the problems of competing systems and applications, standard system implementation schedules, capabilities enhancement options, management improvements, and development of a 5-year ADP program. GRA

N75-25631# University of Southern Calif., Marina del Rey. Information Sciences Inst.
BATCH COMPUTER SCHEDULING: A HEURISTICALLY MOTIVATED APPROACH
Stephen R. Kimbleton Sep. 1974 13 p refs
(Contracts N00014-67-A-0181-0036; DAHC15-72-C-0308; ARPA Order 2223; NR Proj. 049-311)
(AD-A007922) Avail: NTIS CSCL 09/2

Efficient scheduling of jobs for computer systems is a problem of continuing concern. The applicability of scheduling methodology described in the operations research literature is severely restricted by the dimensionality of job characteristics, the number of distinct resource types comprising a computer system, the non-deterministic nature of the system due to both interprocess interaction and contention, and the existence of a multitude of constraints effecting job initiation times, job completion times, and job interactions. In view of the large number of issues which must be considered in job scheduling, a heuristic approach seems appropriate. This paper describes an initial implementation of such an approach based upon a fast, analytically driven, performance prediction tool. GRA

N75-25632# White Sands Missile Range, N.Mex. Data Reduction and Computing Group.
DATA REDUCTION AND COMPUTING GROUP SEMINAR 3RD, SOFTWARE LIFE CYCLE MANAGEMENT TECHNIQUES Final Report
22 Oct. 1974 184 p refs Conference held at Yuma, Ariz., 23 Oct. 1974
(AD-A008369) Avail: NTIS CSCL 09/2

This publication contains the papers presented at the 3rd DR and CG Seminar which dealt with the subject Software Life-Cycle Management Techniques. The papers concern the conception, implementation, operation and termination of software as experienced by management at various military and contractor installations. GRA

N75-25633# Texas Univ., Austin. Center for Cybernetic Studies.
PRIMAL AND DUAL OPTIMALITY CRITERIA IN CONVEX PROGRAMMING
A. Ben-Tal and A. Charnes Feb. 1975 23 p refs
(Contract N00014-75-C-0569; NR Proj. 047-021)
(AD-A008363; CCS-211) Avail: NTIS HC $3.25 CSCL 12/2

This paper considers the problem of minimizing a convex differentiable function subject to convex differentiable constraints. Necessary and sufficient conditions (not requiring any constraints qualification) for a point to be an optimal solution are given in terms of a parametric linear program. Dual characterization theorems are then derived, which generalizes the classical results of Kuhn-Tucker and Fritz John. GRA

N75-25634# Texas Univ., Austin. Center for Cybernetic Studies.
A NEW CLASS OF FEASIBLE DIRECTION METHODS
A. Ben-Tal and S. Zlobec Feb. 1975 31 p refs Prepared in cooperation with McGill Univ.
(Contract N00014-67-A-0126-0009; NR Proj. 047-021)
(AD-A008362; CCS-216) Avail: NTIS CSCL 12/2

This paper introduces a new class of feasible direction methods for solving convex programming problems with differentiable functions. Unlike most currently used feasible direction methods, the ones presented here are not based on the Kuhn-Tucker theory. One of the methods is designed to solve convex problems without assuming Slater's condition or any other constraint qualification. The other method assumes Slater's condition but it provides at each step a feasible direction of steepest descent which is generally better than the one obtained by the classical Zoutendijk method and its variants. GRA

N75-25635# Syracuse Univ., N.Y. Dept. of Systems and Information Science.
RELATIONAL AND CONTINUATION SEMANTICS FOR A SIMPLE IMPERATIVE LANGUAGE
John C. Reynolds Jan. 1975 9 p refs
(Grant NSF GJ-41540)
(PB-239049/0) Avail: NTIS HC $3.25 CSCL 09B

A simple imperative language, containing statement sequences, conditional statements, and while-statements, is defined by a conventional relational approach and by the method of continuations. The two definitions are compared and their fundamental relationship is derived. GRA

62 COMPUTER SYSTEMS

Includes computer networks.

N75-25636*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AUGMENTED BURST-ERROR CORRECTION FOR UNICON LASER MEMORY
Raymond S. Lim Jun. 1974 26 p refs
(NASA-TM-X-62442; A-6090) Avail: NTIS HC $3.75 CSCL 09B

A single-burst-error correction system is described for data stored in the UNICON laser memory. In the proposed system, a long fire code with code length n greater than 16,768 bits was used as an outer code to augment an existing inner shorter fire code for burst error corrections. The inner fire code is a (80,64) code shortened from the (630,614) code, and it is used to correct a single-burst-error on a per-word basis with burst length b less than or equal to 6. The outer code, with b less than or equal to 12, would be used to correct a single-burst-error on a per-page basis, where a page consists of 512 32-bit words. In the proposed system, the encoding and error detection processes are implemented by hardware. A minicomputer, currently used as a UNICON memory management processor, is used on a time-demanding basis for error correction. Based upon existing error statistics, this combination of an inner code and an outer code would enable the UNICON system to obtain a very low error rate in spite of flaws affecting the recorded data. Author

N75-25637*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
QUASI-PERFECT FIFO: SYNCHRONOUS OR ASYNCHRONOUS WITH APPLICATION IN CONTROLLER DESIGN FOR THE UNICON LASER MEMORY
Raymond S. Lim Jan. 1974 15 p refs
(NASA-TM-X-62443; A-6091) Avail: NTIS HC $3.25 CSCL 09B

The first-in-first-out memory buffer (FIFO), is an elastic digital memory whose main application is in data buffering between devices operating at different rates. Data written into the top is moved autonomously down toward the bottom of the FIFO to the lowest unoccupied location, and data read from the bottom of the FIFO will cause data from the top to move autonomously down toward the bottom. The FIFO is available in MOS LSI asynchronous form with data rate in the 1 MHz region. The FIFO described yields a simple high-speed iterative implementation, either synchronous of asynchronous. Because of this simple iterative structure, the FIFO is expandable in both number of words and bits per word, and it is attractive from the viewpoint of integrated-circuit production. For the synchronous FIFO, a model was built and successfully used in the controller for the UNICON laser memory. For the asynchronous FIFO, a model was built and also successfully used in a high-performance magnetic tape controller. Author

N75-25638# Informatique Internationale S.A., Nancy Saint Nicolas (France).
STUDY OF A SCIENTIFIC DATA BASE Final Report
A. Bourdais Jun. 1974 123 p
(Contract ESOC-569/73-AR)
(ESRO-CR(P)-607) Avail: NTIS HC $5.25

A scientific data base was investigated for gathering data from various satellites, stations, sounding rockets, and balloons in order to classify and structure them for easier use. The definition of a scientific data base adapted to ESOC needs, the organization of the data, and orientation of the access means and principles of use are discussed. The characteristics of the data in the data base are described as well as the data input procedure. Different access means to the base data are described from the users point of view, and computer programming specifications are given. ESRO

N75-25639# University of Southern Calif., Marina del Rey. Information Sciences Inst.
A HEURISTIC APPROACH TO COMPUTER SYSTEMS PERFORMANCE IMPROVEMENT. 1: A FAST PREDICTION TOOL
Stephen R. Kimbleton Mar. 1975 32 p refs
(Contracts N00014-67-A-0181-0036; DAHC15-72-C-0308; ARPA Order 2223; NR Proj. 049-311)
(AD-A008152; ISI/RR-74-20) Avail: NTIS CSCL 09/2

The complexity of current computer systems strongly inhibits management usage of analytic modeling techniques in seeking good computer system performance. As a result, heuristically-based approaches are in order. Implementation of such an approach requires: (1) a means for determining the performance of a given computer system processing a given collection of jobs in accord with a specified schedule, (2) a means for achieving an improved system from a given system, and (3) a technique for determining when to stop this iterative process. The objective of this paper is to describe an analytically driven approach to computer system performance prediction which can achieve execution speeds of approximately two orders of magnitude faster than real time for production batch installations while providing detailed information on device utilizations and delays. Thus, it provides a basic required capability for the development of heuristic approaches to computer system performance improvement. GRA

N75-25640# California Univ., Los Angeles. Dept. of Computer Science.
COMPUTER NETWORK RESEARCH Semiannual Technical Report, Jan. - Jun. 1974
Leonard Kleinrock 30 Jun. 1974 53 p refs
(Contract DAHC15-73-C-0368)
(AD-A008422) Avail: NTIS CSCL 09/2

The body of this report contains four papers which cover three research areas. The first is the paper by L. Kleinrock and W. E. Naylor entitled, On Measured Behavior of the ARPA Network. The second area is represented in the second paper, Capacity Allocation in Distributed Computer Networks by D. G. Cantor and M. Gerla. The third area covered in this report describes the use of queueing networks as models for multiple resource computer systems and is represented by the two final papers: Analytic Models for Computer Systems Performance Analysis by R. R. Muntz and Asymptotic Properties of Closed Queueing Network Models by R. R. Muntz and J. W. Wong. The continuing work in satellite packet switching, ground radio packet switching, packetized speech transmission through the ARPANET, large network design procedures, and secure operating systems studies continues to progress and will be reported upon further in future semiannual technical reports. GRA

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N75-25641*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
ROBOT COMPUTER PROBLEM SOLVING SYSTEM Final Report
Joseph D. Becker and E. William Merriam 23 Oct. 1974 30 p
(Contract NASw-2572)
(NASA-CR-142860; AI-22; BBN-2993) Avail: NTIS HC $3.75 CSCL 06D

The conceptual, experimental, and practical aspects of the development of a robot computer problem solving system were investigated. The distinctive characteristics were formulated of the approach taken in relation to various studies of cognition and robotics. Vehicle and eye control systems were structured, and the information to be generated by the visual system is defined. M.J.S.

N75-25642*# Brown Univ., Providence, R.I. Div. of Engineering.

ON THE COST OF APPROXIMATING AND RECOGNIZING A NOISE PERTURBED STRAIGHT LINE OR A QUADRATIC CURVE SEGMENT IN THE PLANE

David B. Cooper and Nese Yalabik Mar. 1975 49 p refs
(Grant NsG-5036)
(NASA-CR-142906) Avail: NTIS HC $3.75

Approximation of noisy data in the plane by straight lines or elliptic or single-branch hyperbolic curve segments arises in pattern recognition, data compaction, and other problems. The efficient search for and approximation of data by such curves were examined. Recursive least-squares linear curve-fitting was used, and ellipses and hyperbolas are parameterized as quadratic functions in x and y. The error minimized by the algorithm is interpreted, and central processing unit (CPU) times for estimating parameters for fitting straight lines and quadratic curves were determined and compared. CPU time for data search was also determined for the case of straight line fitting. Quadratic curve fitting is shown to require about six times as much CPU time as does straight line fitting, and curves relating CPU time and fitting error were determined for straight line fitting. Results are derived on early sequential determination of whether or not the underlying curve is a straight line. Author

N75-25643# Electrotechnical Lab., Tokyo (Japan).

THE STOCHASTIC THEORY OF LEARNING SYSTEMS. FOUNDATIONS OF TRAINABLE PATTERN-RECOGNITION SYSTEMS. FOUNDATIONS OF TRAINABLE PATTERN-RECOGNITION SYSTEMS

Yoshinori Isomichi Dec. 1974 126 p refs In JAPANESE; ENGLISH summary
(Rept-750) Avail: NTIS HC $5.75

Learning systems for pattern recognition were investigated by using the stochastic approximation or the potential function method. The stochastic approximation method is illustrated along with a modification of the method. Other topics discussed include the a posteriori probability, convergence theorems, probabilistic mapping, the learning system of Karuhunene-Loeve subspace, the nonparametric learning of probability distribution, learning system for the finite-mixture distribution, learning system for the Markovian property, and the relation between new learning systems and pattern recognition. Author

N75-25644# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Mathematics and Statistics.

OPTIMAL DESIGN OF A QUEUEING SYSTEM UNDER UNCERTAINTY

Z. Barzily and M. Yadin 1 Apr. 1975 17 p refs Prepared in cooperation with Technion - Israel Inst. of Tech., Haifa
(Contract N00014-67-A-0404-0009; NR Proj. 042-276)
(AD-A008151; TR-19) Avail: NTIS CSCL 12/2

In this study the authors deal with the determination of optimal service rate in an M/M/1 queue. The arrival rate is unknown and assumed to be a random variable with a known distribution function. Holding and operating costs are considered and service rate is determined to minimize total expected discounted costs for infinite horizon. The effects of the arrival rates distribution properties on the characteristics of the system are examined. GRA

N75-25645# Technology Service Corp., Santa Monica, Calif.

MULTI-OBJECTIVE CONTROL THEORY Technical Report, Jan. - Dec. 1974

William S. Meisel and Harold J. Payne 28 Feb. 1975 55 p refs
(Contract N00014-73-C-0412; NR Proj. 041-458)
(AD-A008574; TSC-PD-106-2) Avail: NTIS CSCL 12/2

The research was directed toward the development of systematic procedures for choosing system designs or policies from a continuum of possibilities when each possibility must be judged by many criteria, criteria which are difficult to commensurate. The technical objectives of the research were: (1) to develop the theoretical basis of the multiple objective approach to system design and decision aiding in the finite-dimensional context and to extend the approach to the infinite-dimensional control problem context, and (2) to develop feasible, practical computational algorithms for determining the surface of noninferior solutions both in the finite dimensional and control contexts. GRA

N75-25646# Texas Univ., Austin. Center for Cybernetic Studies.

SOLVING SINGULARLY CONSTRAINED TRANSSHIPMENT PROBLEMS

Fred Glover, D. Karney, D. Klingman, and R. Russell Dec. 1974 32 p refs
(Contract N00123-74-C-2272)
(AD-A008358; CCS-212) Avail: NTIS CSCL 12/2

This paper develops a primal simplex procedure to solve transshipment problems with an arbitrary additional constraint. The procedure incorporates efficient methods for pricing-out the basis, determining representations, and implementing the change of basis. These methods exploit the near triangularity of the basis in order to take full advantage of the computational schemes and list structures used in solving the pure transshipment problem. Also reported is the development of a computer code, I/O PNETS-I for solving large scale singularly constrained transshipment problems. This code has demonstrated its efficiency over a wide range of problems and has succeeded in solving a singularly constrained transshipment problem with 3000 nodes and 12,000 variables in less than 5 minutes on a CDC 6600. Additionally, a fast method for determining near optimal integer solutions is also developed. Computational results show that the near optimum integer solution value is usually within a half of one percent of the value of the optimum continuous solution value. GRA

N75-25647# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.

REDUNDANCY AND DECOUPLING OF INFORMATION IN TWO PERSON QUADRATIC OPTIMIZATION PROBLEMS

Gyorgy Hexner Mar. 1975 29 p refs
(Contract N00014-67-A-0298-0006; Grant NSF GK-31511; NR Proj. 37372-012)
(AD-A008325; TR-658) Avail: NTIS CSCL 12/2

The author examines a class of linear quadratic decision problems with two decision makers. In many such problems one of the decision makers ignores seemingly useful information. The purpose of the report is to study this behavior. It is done in two steps: first it is shown that any two person team or zero-sum decision problem can be decomposed into a sequence of simpler problems; second, this decomposed form of the problems is used to complete the study. GRA

N75-25648# Decisions and Designs, Inc., McLean, Va.

DECISION THEORY RESEARCH Technical Progress Report, 1 Mar. 1974 - 31 Jan. 1975

Clinton W. Kelly, III, Cameron R. Peterson, Rex V. Brown, and Scott Barclay 3 Apr. 1975 72 p refs
(Contract N00014-73-C-0149; ARPA Order 2271; NR Proj. 197-023)
(AD-A008402; TPR-4) Avail: NTIS CSCL 12/2

The report describes research in decision theory and computer aids for decision analysis. Summaries are presented on theoretic concepts including procedures for incorporating multiple dimensions of value in a single measure of utility, improving the structure of decision models, identifying cross cultural differences in the perception of uncertainty and optimizing the amount of information disclosure during bargaining. Several case study applications investigated use of decision analysis for assessment and forecasting, resource allocation, multi-dimensional evaluation, policy formulation and implementation, and negotiation modeling. GRA

N75-25649# Texas Univ., Austin. Center for Cybernetic Studies.

EXPERIMENTS IN A MULTIPLE CHOICE MIXED INTEGER PROGRAMMING ALGORITHM

R. D. Armstrong Feb. 1975 23 p refs
(Contract N00014-67-A-0126-0009; NR Proj. 047-021)
(AD-A008360; CCS-214) Avail: NTIS CSCL 12/2

This paper deals with experimental modifications to the mixed integer branch-and-bound algorithm of Beale and Tomlin. Their algorithm uses the multiple choice structure to dichotomize, not on an individual bivalent variable, but on a subset of variables in a multiple choice class. Partitioning in this manner has proven to be an effective method to obtain more balance penalties and accelerate convergence. The modifications proposed here involve deriving new penalties by enforcing the integer restriction on different combinations of variables and reordering variables within a multiple choice class in an attempt to force an integer solution. GRA

N75-25561 Medical Physics Inst. Utrecht (Netherlands).
FREQUENCY DOMAIN ANALYSIS OF PULSE TRAINS
M. TenHoopen *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 156-164 refs (For availability see N75-25543 16-52)

N75-25562 Medical Physics Inst. Utrecht (Netherlands).
SECOND-ORDER CORRELATIONS AND BISPECTRA OF COMPOSITE RHYTHMS
M. TenHoopen and P. A. Zandt *In its* Res. Activities in Appl. of Phys. and Eng. to Med. Sci. and Probl. Dec. 1974 p 165-171 ref (For availability see N75-25543 16-52)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N75-25650*# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
ALGEBRAIC METHODS IN SYSTEM THEORY
R. W. Brockett, J. C. Willems, and A. S. Willsky Jan. 1975 109 p refs
(Grant NGR-22-007-172)
(NASA-CR-121170) Avail: NTIS HC $5.25 CSCL 12A

Investigations on problems of the type which arise in the control of switched electrical networks are reported. The main results concern the algebraic structure and stochastic aspects of these systems. Future reports will contain more detailed applications of these results to engineering studies. Author

N75-25651*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
AN ALGORITHM AND COMPUTER PROGRAM TO LOCATE REAL ZEROS OF REAL POLYNOMIALS
David R. Hedgley, Jr. Washington Jun. 1975 24 p refs
(NASA-TN-D-8009; H-855) Avail: NTIS HC $3.25 CSCL 12A

A method for reliably extracting real zeros of real polynomials using an expanded two-point secant and bisection method is formed into an algorithm for a digital computer, and a computer program based on this algorithm is presented. The results obtained with the program show that the proposed method compares favorably with the Laguerre, Newton-Raphson, and Jenkins-Traub methods when the polynomial has all real zeros, and is more efficient when the polynomial has complex zeros. Author

N75-25652# Science Research Council, London (England). Rutherford Lab.
IMPROVED METHOD FOR THE NUMERICAL SOLUTION OF THE MAGNETIC FIELD INTEGRAL EQUATION
C. J. Collie and C. W. Trowbridge Nov. 1974 14 p
(RL-74-132) Avail: ERDA Depository Libraries HC $4.00

The equation is solved by replacing the iron by a mesh of triangles in which the magnetization is a linear function of the nodal values. Curvilinear triangles for fitting the boundary of the iron are treated. Author (NSA)

N75-25653# Fondazione Ugo Bordoni, Rome (Italy).
NUMERICAL APPROXIMATION METHODS FOR ELECTRIC NETWORKS [METODI NUMERICI DI APPROSSIMAZIONE POLINOMIALE PER LE RETI ELETTRICHE]
Gianni Orlandi 26 Jun. 1974 36 p refs In ITALIAN
Avail: NTIS HC $3.75

Two methods of polynomial approximation which lend themselves to computerized treatment and can be used in electric network synthesis are presented. The first method, the minimax, solves the problem of approximation of functions without imposed constraints. The second method allows for direct approximation of functions constrained to remain nonnegative for any value of the pulsation. Such a method allows for the further introduction of other constraints. ESRO

N75-25654# Fondazione Ugo Bordoni, Rome (Italy).
TRUNCATION ERROR EVALUATION IN THE REPRESENTATION OF NON-MOVING IMAGES BY SERIES DEVELOPMENT OF BIDIMENSIONAL ORTHONORMAL FUNCTIONS [VALUTAZIONE DELL'ERRORE DI TRONCAMENTO NELLA RAPPRESENTAZIONE DI IMMAGINI FISSE MEDIANTE SVILUPPI IN SERIE DI FUNZIONI ORTONORMALI BIDIMENSIONALI]
Gaetanino Agnoli, Odoardo Brugia, and Aldo Roveri 16 Apr. 1974 34 p refs In ITALIAN
Avail: NTIS HC $3.75

The representation of nonmoving images in the domain of transformed variables (especially referring to images continuous in space) is discussed with a view to image redundancy elimination. The image signal is developed in series of two dimensional orthonormal functions. The effects of series development truncation are discussed when applied to parallelipipedic functions, complex exponential functions, Maar functions, and Walsh functions. For each of these four types, the explicit expressions of the truncation error is given as a function of the series development order. A numerical evaluation was performed which assumed that the image is the realization of a random process with exponential spatial autocorrelation function. The results are shown to be essentially equivalent for the four types of functions. ESRO

N75-25655# Army Research Office, Durham, N.C.
TRANSACTIONS OF THE CONFERENCE OF ARMY MATHEMATICIANS (20TH)
Mar. 1975 633 p refs Conf. held at Natick, Mass., 14-16 May 1974
(AD-A008001; ARO-75-1) Avail: NTIS CSCL 12/1

This is a technical report resulting from the Twentieth Conference of Army Mathematicians. It contains most of the papers on the agenda of this meeting. These treat various Army applied mathematical problems. GRA

N75-25656# Cornell Univ., Ithaca, N.Y. Dept. of Operations Research.
A BIVARIATE TEST OF GOODNESS OF FIT BASED ON A GRADUALLY INCREASING NUMBER OF ORDER STATISTICS
Jose Kreimerman Mar. 1975 86 p refs
(Contracts DAHC04-73-C-0008; N00014-67-A-0077-0020)
(AD-A008205; TR-250) Avail: NTIS CSCL 12/1

An important area of Statistical Inference relates to the problem of assessing the conformity or goodness of fit of some observations to a null hypothesis. This hypothesis may be that the observations came from a distribution which belongs to a given family or may be a completely specified distribution. A statistical procedure which solves such a problem is called a test of goodness of fit. This thesis is concerned with the problem of testing the goodness of fit of a sample drawn from a continuous bivariate distribution, where the null hypothesis is that the true distribution is a completely specified one. A test is developed, where the test criterion is based in some functions of a subset of order statistics, functions which depend on the distribution under the null hypothesis. GRA

N75-25657# California Univ., San Diego.
ESTIMATION OF THE LOG SURVIVOR FUNCTION AND HAZARD FUNCTION
John Rice and Murray Rosenblatt Feb. 1975 35 p refs
(Contract N00014-69-A-0200-6016; NR Proj. 042-217)
(AD-A008168) Avail: NTIS CSCL 12/1

A detailed analysis of the bias and covariance properties of estimates of the log survivor function and hazard function is given. A discussion is given of the behavior of estimates when the observations are dependent. A global measure of deviation is also considered. There are comments on Monte Carlo simulation and application of the results. GRA

N75-25658# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
SOME PRACTICAL ASPECTS OF THE TREATMENT OF ILL-POSED PROBLEMS BY REGULARIZATION Interim Report, Jun. 1971 - Jul. 1974
D. A. Lee, R. M. Potter, W. Perry, and W. Schmaedek Feb. 1975 99 p refs Prepared in cooperation with Technology, Inc., Dayton, Ohio
(Contract F33615-71-C-1463; AF Proj. 7071)
(AD-A008167; ARL-75-0022) Avail: NTIS CSCL 12/1

Ill-posed mathematical problems arise in many areas of applied science and engineering of interest to the Air Force. Among these are numerical differentiation, system identification, space object identification, and determination of polymer molecular weight distributions. This report provides a fairly comprehensive introduction to the analysis of regularizable ill-posed problems. Several specific solution techniques are examined and compared in the light of a representative example, and some general solution methods are described. GRA

N75-25659# Brown Univ., Providence, R.I. Lefschetz Center for Dynamical Systems.
LYAPOUNOV CONVEXITY THEOREM AND RIEMANN-TYPE INTEGRALS
Zvi Artstein Nov. 1974 20 p refs
(Contract N00014-67-A-0191-0009; Grant NSF GP-28931X)
(AD-A008243) Avail: NTIS CSCL 12/1

By adopting the Riemann-Type integral the author gives an elementary and measure-theory free proof to the Lyapounov convexity theorem in infinite dimensional topological vector spaces. GRA

N75-25660# Florida State Univ., Tallahassee. Dept. of Statistics.
SCIENCE, STATISTICS, AND PAIRED COMPARISONS
Ralph A. Bradley Mar. 1975 44 p refs
(Contract N00014-67-A-0235-0006)
(AD-A008391; FSU-Statistics-M337) Avail: NTIS CSCL 12/1

The paper begins with a prologue on science and statistics. It is suggested that more emphasis should be placed on the scientific method in the teaching of science and that statistics is a science and should be taught and practiced as a science. The statistician as a scientist must be concerned with the formulation, modification and verification of stochastic models. The main sections of the paper deal with a method of paired comparisons proposed originally by Zermelo and rediscovered by Bradley and Terry, Ford, and others. The paper concludes with an epilogue indicating some need for help for those engaged in the development of statistical methodology from those concerned with the mathematics of statistics and probability. GRA

N75-25661# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
LECTURES ON DESIGN THEORY
J. C. Kiefer Dec. 1974 56 p refs Sponsored in part by NSF
(Contract N00014-67-A-0226-0014)
(AD-A008170; Mimeo-Ser-397) Avail: NTIS CSCL 12/1

The material is an elementary expository presentation of various aspects of the theory of designing experiments. GRA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N75-25662# Naval Research Lab., Washington, D.C.
IDENTIFYING AN UNKNOWN STATIC PROCESS HAVING UNIFORMLY DISTRIBUTED OBSERVATIONAL ERRORS
Harold L. Stalford 2 Apr. 1975 18 p refs
(RR0140201)
(AD-A008551; NRL-7784) Avail: NTIS CSCL 12/1

The problem of identifying a black box having uniformly distributed errors in the observations is investigated. In particular, those black boxes are studied for which the space of candidate models is infinite dimensional. Since such black boxes cannot be identified deterministically by using a finite amount of data, the concept of a probability of identification is followed. An adequacy criterion for modeling is defined in which a model is adequate provided it passes a finite sequence of tests, the length of which depends on the desired probability of identification. An algorithm is presented for determining an adequate model within the space of polynomial functions. GRA

N75-25663# Florida State Univ., Tallahassee. Dept. of Statistics.
STEPWISE BAN ESTIMATORS FOR EXPONENTIAL FAMILIES WITH MULTIVARIATE NORMAL APPLICATIONS
Allan R. Sampson Nov. 1974 17 p refs
(Contract N00014-67-A-0235-0006; Grant NSF GP-17172)
(AD-A008389; FSU-Statistics-M324; TR-ONR-90) Avail: NTIS CSCL 12/1

Consistent, asymptotically efficient and asymptotically normal stepwise estimators are given for a subclass of the uniparametric and multiparametric exponential families. The estimators are derived by using the Robbins-Monro stochastic approximation procedure with certain families of random variables arising from the normalized log-likelihood. Considered in detail are three multivariate normal examples where the maximum likelihood estimators are not tractable. GRA

N75-25664# Florida State Univ., Tallahassee. Dept. of Statistics.
SIMPLE BAN ESTIMATORS OF CORRELATIONS FOR CERTAIN MULTIVARIATE NORMAL MODELS WITH KNOWN VARIANCES
Allan R. Sampson Feb. 1975 19 p refs
(Grant NSF GP-17172)
(AD-A008390; FSU-Statistics-M332; TR-ONR-91) Avail: NTIS CSCL 12/1

It is well-known that in certain multivariate normal models with known variances, maximum likelihood estimation of correlations is arithmetically cumbersome. For many of these models, the author gives a technique to obtain estimators which are relatively simple functions of the sufficient statistics and are BAN. The procedure makes use of the fact that many of the likelihood equations for these models are essentially cubic equations. For the associated cubic equation, an explicit solution is found which is consistent for the parameter to be estimated. The author is then able to show that this solution has the appropriate asymptotic efficiency and normality properties. Considered in detail are the intraclass, autoregressive, and moving average models. GRA

N75-25665# Florida State Univ., Tallahassee. Dept. of Statistics.
ON NULL-HYPOTHESIS LIMITING DISTRIBUTIONS OF KOLMOGOROV-SMIRNOV TYPE STATISTICS WITH ESTIMATED LOCATION AND SCALE PARAMETERS
R. J. Serfling and Constance L. Wood Mar. 1975 19 p refs
(Contract N00014-67-A-0235-0006)
(AD-A008393; FSU-Statistics-M339; TR-Onr-94) Avail: NTIS CSCL 12/1

The authors treat the goodness of fit problem of testing whether the distribution F of a random sample X(1),..., X(n) belongs to a specified location and scale family, with the particular values (alpha, beta) of the location and scale parameters not both specified. GRA

N75-25666# Oregon Research Inst., Eugene.
DOMINANCE OF INDIVIDUATING INFORMATION AND NEGLECT OF BASE RATES IN PROBABILITY ESTIMATION
Don Lyon and Paul Slovic 21 Feb. 1975 26 p refs
(Contract N00014-73-C-0438; ARPA Order 2449; NR Proj. 197-026)
(AD-A008410; Research-Bull-Vol-15-1-75) Avail: NTIS CSCL 05/10

According to the normative theory of prediction, prior probabilities (base rates) which summarize what we know before receiving any specific evidence, should remain relevant even after such evidence is obtained. In the present study, subjects were asked to estimate the probability that one of two states was true on the basis of (a) information about the prior probabilities of the states and (b) individuating information, specific to the case at hand and known to be accurate with probability p. Subjects: responses were determined predominantly by the specific evidence; the prior probabilities were neglected, causing the judgments to deviate markedly from the normative response. Theoretical and practical implications of this result are discussed. GRA

N75-25667# North Carolina Univ., Chapel Hill. Dept. of Statistics.
AN INVARIANT SEQUENTIAL TEST FOR ZERO DRIFT BASED ON THE FIRST PASSAGE TIMES IN BROWNIAN MOTION
Nanak Chand Mar. 1975 12 p refs
(Contract DAHC04-74-C-0030)
(AD-A008418; Mimeo-Ser-987; ARO-11959-2-M) Avail: NTIS CSCL 12/1

An invariant sequential test for zero drift based on the first passage times in Brownian motion is constructed and its properties discussed. GRA

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N75-25668# North Carolina State Univ., Raleigh. Operations Research.
THE 'HUB' AND 'WHEEL' SCHEDULING PROBLEMS. PART 1: THE HUB SCHEDULING PROBLEM: THE MYOPIC CASE
S. Arisawa (Mitsubishi Petrochemical Co., Ltd., Tokyo) and Salah E. Elmaghraby (Catholic Univ. of Leuven) Mar. 1975 46 p refs Sponsored in part by NSF
(Contract N00014-70-A-0120-0002; Grant DA-ARO(D)-31-124-72-G106)
(AD-A008425; NSU-OR-102-Pt-1) Avail: NTIS CSCL 12/2

The problem is that of scheduling truck movement (loaded and empty) between a central depot (the hub) and a number of outlying cities. Current demand is known deterministically, but future demand is uncertain. The myopic case treats two periods only: the current period and one future period. The objective is to minimize the expected total operating penalty, consisting of the costs of moving empties and the costs of delaying shipments. In two special cases the procedure of solution reduces to simple marginal analysis. In the general case, a network flow model is proposed that is easily solved. Part II generalized the planning horizon to multiple planning periods, including the infinite horizon. Part III generalizes the problem to permit inter-city shipments (the wheel problem). GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

No abstracts in this category.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N75-25669 British Library Lending Div., Boston Spa (England).
PRODUCTION AND DEMONSTRATION OF HELICAL SURFACE WAVES OVER CYLINDRICAL BODIES BY NON-CONTACTING ELECTRODYNAMIC TRANSDUCERS
J. Herbertz 14 May 1974 17 p refs Transl. into ENGLISH from Acustica (West Germany), v. 27, no. 3, Sep. 1973 p 113-121
(BLL-CE-Trans-6405-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Continuous sound transmission techniques are described with respect to a material testing method involving helical mode-changing at faults. With the help of this method the transmission of helical modes on nonmagnetic metal rods and tubes is experimentally demonstrated. Ultrasonic waves on the surface of solid bodies in the form of Rayleigh surface waves are used successfully to detect surface cracks. Author

N75-25670# Pisa Univ. (Italy).
ON THE PROPAGATION OF FIRST ORDER WAVES IN INCOMPRESSIBLE THERMOELASTIC SOLIDS
Giovambattista Amendola [1973] 22 p refs Repr. from Bollettino. UMI (Italy), v. 4, no. 7, 1973 p 267-284
(Rept-1452) Avail: NTIS HC $3.25

The growth of the amplitude of plane waves as a function of time of isothermal deformations was studied. An isothermal potential is shown and discussed. The first and second laws of thermodynamics are applied, and theoretical aspects of plane wave propagation are developed. J.R.T.

N75-25671# European Space Research Organization, Paris (France).
THEORY OF THE PROPAGATION UPSTREAM OF WAVE-LIKE DISTURBANCES IN A SUBSONIC FREE JET
G. Neuwerth Mar. 1975 50 p refs Transl. into ENGLISH of "Theorie der Ausbreitung wellenfoermiger Stoerungen entgegen Stroemungsrichtung in einem Unterschall-Freistrahl", Tech. Hochschule, Aachen Report DLR-FB-74-20, 1974 Original German report available from DFVLR, Porz, West Ger. 20.90 DM
(ESRO-TT-141; DLR-FB-74-20) Avail: NTIS HC $3.75

A propagation model was investigated in which waves travel obliquely to the jet axis, and are totally reflected at the jet boundary layer; the reflected waves are superimposed on the original waves. This pressure wave causes ring vortices to form in the free boundary layer near the nozzle exit. The results of a theoretical computation of the propagation upstream of wavelike disturbances show good agreement with the solutions obtained from the model. The decrease, in the direction perpendicular to the jet axis, of the near field induced outside the jet is computed. Author (ESRO)

N75-25672# Colorado State Univ., Fort Collins.
AN EXPERIMENTAL AND THEORETICAL INVESTIGATION OF THE MAGNETIZATION PROPERTIES AND BASIC ELECTROMECHANICS OF FERROFLUIDS
T. B. Jones and D. A. Krueger Sep. 1974 40 p refs
(Contract N00014-67-A-0299-0020; NR Proj. 097-390)
(AD-A001107) Avail: NTIS CSCL 20/3

The purpose of this study is to investigate the basic magnetization processes and properties of ferrofluids and to apply the findings to the continuum electromechanics in order to develop better models for the magnetically coupled hydrodynamics of these stable colloidal suspensions. The magnetization studies have included (1) long-term magnetization measurements, (2) osmotic pressure measurements, and (3) theoretical and experimental magnetitie particle agglomeration and settling studies. GRA

N75-24976 Joint Publications Research Service, Arlington, Va.
THE ERROR IN DETERMINING THE VELOCITY VECTOR OF MOVING OBJECTS IN TWO-POINT DIRECTION FINDING BY THE DOPPLER EFFECT
Ya. Ye. Belenkiy, V. K. Yeremenko, and Yu. I. Spektor *In its* Signal Selection and Transmission (JPRS-64817) 21 May 1975 p 21-27 refs Transl. into ENGLISH from Otbor i Peredacha Informatsii (Kiev), no. 24, 1970 p 130-135 (For availability see N75-24973 16-31)

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution.*

N75-25673*# Wichita State Univ., Kans.
THE TRANSMISSION OF SOUND IN NONUNIFORM DUCTS Final Report
Walter Eversman [1975] 73 p refs
(Grant NGR-17-003-018)
(NASA-CR-142861) Avail: NTIS HC $4.25 CSCL 20A

The method of weighted residuals in the form of a modified Galerkin method with boundary residuals was developed for the study of the transmission of sound in nonuniform ducts carrying a steady, compressible flow. In this development, the steady flow was modeled as essentially one dimensional but with a kinematic modification to force tangency of the flow at the duct walls. Three forms of the computational scheme were developed using for basis functions (1) the no-flow uniform duct modes, (2) positive running uniform duct modes, with flow, and (3) positive and negative running uniform duct modes, with flow. The formulation using the no-flow modes was the most highly developed, and has advantages primarily due to relative computational simplicity. Results using the three methods are shown to converge to known solutions for several special cases, and the most significant check case is against low frequency, one dimensional results over the complete subsonic Mach number range. Development of the method is continuing, with emphasis on assessing the relative accuracy and efficiency of the three implementations. Author

N75-25674*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
THERMAL ACOUSTIC OSCILLATIONS, VOLUME 2 Final Report
Lawrence W. Spradley, William H. Sims, and Chien Fan Mar. 1975 140 p refs 3 Vol.
(Contract NAS8-26642)
(NASA-CR-102776; LMSC-HREC-TR-D390690-2) Avail: NTIS HC $5.75 CSCL 20A

A number of thermal acoustic oscillation phenomena and their effects on cryogenic systems were studied. The conditions which cause or suppress oscillations, the frequency, amplitude and intensity of oscillations when they exist, and the heat loss they induce are discussed. Methods of numerical analysis utilizing the digital computer were developed for use in cryogenic systems design. In addition, an experimental verification program was conducted to study oscillation wave characteristics and boiloff rate. The data were then reduced and compared with the analytical predictions. D.M.L.

N75-25675# Southampton Univ. (England). Inst. of Sound and Vibration Research.
EXPERIMENTAL OBSERVATION OF SELF INDUCED SOUND GENERATION DUE TO FLOW OVER PERFORATED LINERS IN A DUCT
C.-Y. Tsui 1 Dec. 1974 47 p
(ISVR-TR-70) Avail: NTIS HC $3.75

An adverse 'singing' phenomenon due to flow over perforate liners in a duct was studied experimentally. The liners consisted of honeycomb structures bonded to and sandwiched between two flat aluminium skins. The inner skin in contact with the flow had holes (perforations) with pitch distances either equal to or different from those of the honeycomb structures, forming narrow-band or broadband liners. The shedding of vortices in the flow over these holes induced excitation of acoustic modes within the duct and under the condition whereby the cut-on frequency of an excited mode coincided with or was very near to the shedding frequency, a very strong tone resulted, the acoustic pressure distribution within the duct being dominated by it. For narrow-band liners, the 'singing' phenomen could also be induced by cavity resonance. The shedding frequency increased with increase in flow velocities and thus higher order acoustic modes were excited. The Strouhal number calculated from the observed shedding frequency and the flow velocity was found to vary directly with the hole diameter of the perforate. Author

N75-25676# Southampton Univ. (England). Inst. of Sound and Vibration Research.
THE ACOUSTIC SPECTRUM OF AXIAL FLOW MACHINES
S. E. Wright Apr. 1975 111 p refs Presented at the 144th Meeting of the Noise Res. Committee, London, 22 Apr. 1975 Submitted for publication
(ISVR-TR-69) Avail: NTIS HC $5.25

Rotor spectra from a variety of axial flow machines were compared and acoustic trends examined. Types of rotors considered in the investigation included aircraft propellers, helicopter rotors, jet engine compressor and by-pass fans and a range of domestic, automotive and industrial cooling fans. Rotor sizes varied from 15 in. to 60 ft in diameter and tip speeds from 200 ft/s to transonic speeds. The study showed that the acoustic output from these various rotor devices can be described by a common characteristic spectrum. In particular, the minimum broadband noise generated by ducted and free field rotors corresponds to laminar and turbulent boundary layer shedding, and discrete excess noise is generated by various degrees of impulsive blade loading. Finally the study showed that aerodynamic details can be interpreted from the acoustic spectra, and as a result, new insight into the mechanisms of rotor noise was formed. Author

N75-25677*# Kanner (Leo) Associates, Redwood City, Calif.
THE CURVES OF CONSTANT VOLUME FOR CONTINUOUS TONES AND FOR INDIVIDUAL PRESSURE IMPULSES
R. Feldtkeller Washington NASA Jun. 1975 9 p refs Transl. into ENGLISH from Frequenz (West Ger.), v. 10, no. 11, 1956 p 356-358
(Contract NASw-2481)
(NASA-TT-F-16425) Avail: NTIS HC $3.25 CSCL 20A

The curves of constant volume of Gauss' pressure impulses, which show the course of the peak sound level with impulse duration, are contrasted with the curves of constant volume of continuous tones, which show the course of the effective sound level with the frequency. Author

N75-25678# Catholic Univ. of America, Washington, D.C. Center for Applied Research.
BEAMFORMING FOR HYDROPHONE ARRAYS BY MEANS OR RESISTORS AND OPERATIONAL AMPLIFIERS
Henning F. Harmuth Feb. 1975 24 p refs
(Contract N00014-67-A-0377-0023)
(AD-A008542) Avail: NTIS CSCL 20/1

The report discusses a low cost method of beamforming for acoustic arrays. It uses mainly resistors and operational amplifiers. The operating frequency band ranges from DC to upward of 100 kHz. The method is presently used to produce 256 beams simultaneously, using the output voltages of a two-dimensional hydrophone array having 16 x 16 hydrophones. The discussion is nonmathematical and is intended to explain the principle. References for a detailed mathematical discussion are given. GRA

N75-25679# Wyle Labs., Inc., El Segundo, Calif.
ATMOSPHERIC ABSORPTION OF SOUND: A RESONANCE TUBE APPARATUS FOR ABSORPTION MEASUREMENTS Final Report, 16 Sep. 1972 - 31 Dec. 1974
Mark C. Lee and Louis C. Sutherland Mar. 1975 55 p refs
(AD-A008408; WR-75-1; ARO-8725-9-E) Avail: NTIS CSCL 20/1

The bulk acoustic absorption coefficient has been measured in pure nitrogen gas using a stainless steel cylindrical resonance tube at pressures between 1 to 100 atm and temperatures between 20 and 200C with various moisture contents. The boundary layer loss in the apparatus, which was measured to be within 2 per cent of the theoretical prediction, tends to dominate the total absorption measured in nitrogen with this apparatus. Improved acoustic impedance match between the gas and the cylindrical wall also contributes significantly to the inherent sound absorption of the apparatus at high pressures. GRA

N75-25680# Pennsylvania State Univ., University Park. Applied Research Lab.
INTERACTION OF A SPHERICAL ACOUSTIC WAVE WITH AN ELASTIC SPHERICAL SHELL

Gerald C. Lauchle 6 Mar. 1975 31 p refs
(Contract N00017-73-C-1418)
(AD-A008239; TM-75-50) Avail: NTIS CSCL 20/1

The interaction of a spherical acoustic wave with an elastic spherical shell is treated analytically. The solution includes the coupling between the acoustic sound field and vibration of the shell with any degree of fluid loading. The formulation for the far-field acoustic pressure is derived in terms of natural spherical wave functions, the properties of the acoustic medium, and the material constants of the shell. The far acoustic field is computed for a thin aluminum shell and several sound source locations over a large range of ka, where k is the wavenumber, and a is the shell radius. It is shown that the acoustic pressure depends significantly on whether the shell is in air or is submerged in water, particularly when the sound source is very near the surface. GRA

N75-25681# Texas Univ., Austin. Applied Research Labs.
NONLINEAR PARAMETRIC TRANSDUCTION IN UNDERWATER ACOUSTICS Final Report, 1 Dec. 1971 - 31 Dec. 1974
Thomas Muir 15 Jan. 1975 50 p refs
(Contract N00014-70-A-0166-008; NR Proj. 240-014)
(AD-A008203; ARL-TR-75-7) Avail: NTIS CSCL 20/1

Over the past decade, nonlinear acoustics has experienced and unprecedented expansion in theory, experiment, and application. This vigorous activity has its roots in Westervelt's theoretical discovery of the parametric acoustic array (1960). This type of transducer uses the nonlinear properties of the water itself to produce a low frequency, superdirective radiation from the parametric interaction of two high frequency generating waves. The superdirective radiation so created is a wide band entity having no spatial diffraction lobes. Several practical applications of parametric arrays are now emerging; these include bathymetric profiling, the location of artifacts in marine archeology, ultrasonic imaging and biomedical diagnostics, and measurements on waveguide propagation in shallow water. This paper will survey some of the fundamentals underlying these phenomena and will demonstrate their behavior and their application by presenting experimental results. GRA

N75-25682# Raytheon Co., Portsmouth, R.I. Submarine Signal Div.
TRANSDUCER AND TRANSMITTER CONFIGURATIONS FOR FINITE AMPLITUDE SONARS Final Report
J. L. Butler and H. C. Single 15 Mar. 1975 64 p refs
(Contract N00024-74-C-1060)
(AD-A008379) Avail: NTIS CSCL 17/1

Finite Amplitude Sonar, also referred to as Parametric or Non-Linear Sonar, requires generation of high acoustic source levels. These high levels require high electrical powers and may stress transmitter and transducer components beyond normal linear ranges. Unless guarded against, such stresses introduce distortions into the signal paths and degrade the unique properties of Finite Amplitude operation. This report describes various transducer and transmitter configurations which can be applied to Finite Amplitude Sonar and discusses the potential advantages and disadvantages of each. Two opposing requirements are considered--high source levels and minimum signal distortion. GRA

N75-24974 Joint Publications Research Service, Arlington, Va.
REFLECTION OF A PLANE SOUND WAVE FROM A THIN ELASTIC INFINITE PLATE IN A FLUID
I. I. Gnatovskiy *In its* Signal Selection and Transmission (JPRS-64817) 21 May 1975 p 1-7 refs Transl. into ENGLISH from Otbor i Peredacha Informatsii (Kiev), no. 22, 1969 p 61-66
(For availability see N75-24973 16-31)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N75-25683*# Westinghouse Electric Corp., Elmira, N.Y. Electronic Tube Div.
SOLID STATE RADIOGRAPHIC IMAGE AMPLIFIERS, PART C Final Report, Mar. 1970 - May 1971
Zoltan Szepesi Jun. 1971 54 p refs
(Contract NAS8-25678)
(NASA-CR-61377) Avail: NTIS HC $4.25 CSCL 09L

The contrast sensitivity of the radiographic amplifiers, both the storage type and nonstorage type, their absolute sensitivity, and the reproducibility of fabrication were investigated. The required 2-2T quality level was reached with the radiographic storage screen. The sensitivity threshold was 100 to 200 mR with 45 to 100 kV filtered X-rays. The quality level of the radiographic amplifier screen (without storage) was 4-4T; for a 6 mm (0.25 in.) thick aluminum specimen, a 1 mm (0.040 in.) diameter hole in a 0.25 mm (0.010 in.) thick penetrameter was detected. Its sensitivity threshold was 2 to 6 mR/min. The developed radiographic screens are applicable for uses in nondestructive testing. Author

N75-25684# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
SCATTERING OF HIGH-VELOCITY NEUTRAL PARTICLES. 18. He-(CH3F, CH2F2, CHF3)
I. Amdur, M. S. Longmire, J. E. Jordan, and E. A. Mason (Brown Univ.) [1975] 9 p refs
Avail: NTIS HC $3.25

Fast He beams were scattered by room-temperature CH3F, CH2F2, and CHF3 to obtain average potentials (energy in eV and separation in A. The results agree with independent measurements by Fink, King, and Freeman where they overlap. The peripheral-force approximation, which assumes that the centers of force in a molecule are located at the nuclei of each atom, has been used to calculate potentials for the above systems from previous measurements on He-CH4 and He-CF4. The calculated potentials are in only fair agreement, being systematically high. Sources of the discrepancies are discussed. Author

N75-25685# Electrotechnical Lab., Tokyo (Japan).
FUNDAMENTAL STUDY FOR ION BEAM APPLICATIONS
Keizo Shimizu Dec. 1974 85 p refs In JAPANESE; ENGLISH summary
(Rept-748) Avail: NTIS HC $4.75

Current practical applications of ion beams are surveyed. A plasmatron-type ion source for metallic elements is described in which a vaporizer oven and an intermediate electrode are combined into one set, and the arc discharge runs through the space in which the charge material is contained. Symmetrical electrostatic lenses consisting of three apertures of equal diameter were investigated by computer analysis. Space charge effects on ion beam focusing were studied theoretically and experimentally, and the paths of ion beams were directly photographed. The ion scattering in gaseous media is discussed, and the penetration of argon ions in the energy range of 5-35 keV in air, helium, and nitrogen at various pressures was measured. The extrapolated ranges of ions obtained from the transmission curves agree with those obtained by the Lindhard theory. An experimental study is described of contamination layer formed on an aluminum substrate by 5-35 keV argon ion bombardment, the ion bombarding time, the current density, the ion energy and the substrate temperature being varied. The results are compared with a simple theory which is derived from a contamination theory for electron bombardment in consideration of sputtering effect, and a good qualitative agreement is obtained. Author

N75-25686*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MOLECULAR RELAXATIONS, MOLECULAR ORIENTATION, AND THE FRICTION CHARACTERISTICS OF POLYIMIDE FILMS
Robert L. Fusaro 1975 40 p refs Proposed for presentation at Lubrication Conf., Miami Beach, Fla., 21-23 Oct. 1973; sponsored by Am. Soc. of Lubrication Engr. and ASME
(NASA-TM-X-71739; E-8021) Avail: NTIS HC $3.75 CSCL 20H

The friction characteristics of polyimide films bonded to metallic substrates were studied from 25 to 500 C. These results were interpreted in terms of molecular orientation and thermomechanical data obtained by torsional braid analysis (TBA). A large friction transition was found to occur at 40 + or - 10 C in a dry argon atmosphere (10 ppm H2O). It was postulated that the mechanical stresses of sliding transform or reorder the molecules on the surface into a configuration conducive to easy shear, such as an extended chain. The molecular relaxation which occurs in this temperature region appears to give the molecules the necessary freedom for this reordering process to occur. The effects of velocity, reversibility, and thermal prehistory on the friction properties of polyimide were also studied. Author

N75-25687# Japan Atomic Energy Research Inst., Tokyo.
EFFECTS IN ELECTRON BOMBARDMENT OF LITHIUM FLUORIDE SINGLE CRYSTALS AT HIGH TEMPERATURES. 1: THE DEPTH DISTRIBUTION OF F CENTER DENSITY. 2: THE FORMATION OF COLLOIDAL CENTERS
K. Kubo Jul. 1974 14 p refs
(JAERI-M-5800) Avail: ERDA Depository Libraries

The peak height of F absorption band vs. depth from the surface was measured in LiF crystal bombarded by electrons. The depth distribution of F center density is characterized by multiple scattering of electrons in the crystal, and it agrees primarily with the depth distribution of electron energy loss calculated with the Spencer theory. With increase of the bombarding electron dosage, the F center density curve deviates from the theoretical energy loss curve due to the saturation of F center density. An additional shoulder appears beyond the electron range, which is possibly caused by the secondary photons emitted during penetration of the electrons in LiF. The colloidal centers formed in electron-bombarded pure LiF crystals were studied in heat-treatment up to 700 C. The optical absorption bands induced were the same as those by neutron-irradiation, except lack of the 550 nm (S) band (which indicates that the neutron effect in LiF amounts nearly to the ionization with localized heating). Author (NSA)

N75-25688# Yale Univ., New Haven, Conn. Dept. of Engineering and Applied Science.
GROWTH OF SPHERICAL DROPLETS BY CONDENSATION IN A QUIESCENT, FREE MOLECULAR ENVIRONMENT
Benjamin J. C. Wu Mar. 1975 24 p refs
(Contract N00014-67-A-0097-0012)
(AD-A008242; Rept-30) Avail: NTIS CSCL 07/4

Approximate, explicit solutions to the simultaneous heat and mass transfer equations governing the growth of spherical droplets by condensation in a quiescent, supersaturated vapor have been obtained. Free molecule flow conditions are assumed. The temperature and growth rate of droplets under the near thermal equilibrium and near saturation conditions are given as explicit functions of the thermodynamic state of the gaseous phase and the droplet size only. The near saturation, and near equilibrium conditions are satisfied in the practical cases of droplets growing in a pure vapor, and a dilute mixture of a vapor with a noncondensing carrier gas, respectively. The accuracy of the approximation formulas is quite satisfactory; for the typical conditions tested, the maximum error is a few percent. GRA

N75-25689# Aerospace Corp., El Segundo, Calif. Lab Operations.
FLOW TUBE MEASUREMENTS OF H + HF(V) DEACTIVATION RATES Interim Report
Munson A. Kwok and Roger L. Wilkins 25 Mar. 1975 10 p refs
(Contract F04701-74-C-0075)
(AD-A008174; TR-0075(5530)-1; SAMSO-TR-75-86) Avail: NTIS CSCL 07/4

A medium-pressure flow tube was used to determine the rate constants for vibrational deactivation of HF (v = 1,2,3) by H-atoms by monitoring the HF vibration-rotation emission. The deactivation of HF (V) by H-atoms is found to be a very efficient energy transfer process. The experimental results are compared with available theoretical data of Wilkins. GRA

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N75-25690# Pisa Univ. (Italy).
PARTICLE SIZE DETERMINATION BY BETA-RAY ABSORPTION
G. Curzio May 1973 18 p refs
(Rept-1464) Avail: NTIS HC $3.25

A cumulative method for particle size determination was developed. The mass deposited from a homogeneous suspension is determined by a beta-absorption thickness measurement technique. Experimental tests on some different samples of soil are reported; the results are compared with those obtained using the conventional methods of the Andreasen pipette and sedimentation balance. Author

N75-25691# Japan Atomic Energy Research Inst., Tokyo.
STUDY ON FAST BREEDER REACTOR INSTRUMENTATION. 2: GAMMA IRRADIATION TESTS OF WIRE AND ELECTRONIC COMPONENT MATERIALS
T. Kakuta, N. Wakayama, and T. Kawakami Aug. 1974 97 p refs Prepared for Power Reactor and Nucl. Fuel Develop. Corp.
(JAPFNR-172; J-250-71-06) Avail: ERDA Depository Libraries HC $8.00

Insulation materials of cables and cable connectors, which are used in fast breeder reactor instrumentation and alpha-gamma hot caves, were tested by the Co-60 gamma ray source facility in JAERI. The tests were performed under the environment condition of room temperature, air, and nitrogen gas, and in heated air (100 and 150 C). The maximum radiation dose of gamma-ray was 6 times 10 to the 8th power R. It was found that polyimide,-imido, ethylene-propylen rubber and cross-linked polyethylene are highly resistant to radiation. The data and the discussion obtained are available for use in selection of the materials which are to be used in radiation environments. Author (NSA)

N75-25692# Washington Univ., Seattle.
PROGRAM B, THEORETICAL NUCLEAR PHYSICS PROGRAM Progress Report, 1 Oct. 1973 - 30 Sep. 1974
1973 45 p refs
(Contract AT(45-1)-1388)
(RLO-1388-679) Avail: NTIS HC $3.75

Research on nuclear reactions, nuclear structure and symmetries, quantum statistical mechanics and many-body problems, field theory and elementary particles, atomic physics, general theory, and astrophysics is summarized. A list of publications is included. NSA

N75-25693# Brookhaven National Lab., Upton, N.Y.
FAST NEUTRON RADIATION DAMAGE OF HIGH PURITY GERMANIUM DETECTORS
H. W. Kraner, Richard H. Pehl (Calif. Univ., Berkeley, Lawrence Berkeley Lab.), and Eugene E. Haller (Calif. Univ., Berkeley, Lawrence Berkeley Lab.) Dec. 1974 22 p refs Presented at Nucl. Sci. Symp., Washington, D. C., 11 Dec. 1974 Sponsored by ERDA
(BNL-19488; Conf-741213-10) Avail: NTIS HC $3.25

Seven high resolution, high-purity planar germanium and two lithium-drifted germanium detectors were exposed to fluences of monoenergetic fast neutrons of 1.4, 5.5 and 16.4 MeV to study radiation damage effects. Seven of the exposures were made at 5.5 MeV using detectors made from both LBL and General Electric Company material. Initial degradation of CO-60 energy resolution was generally observed after fluences of 3 x 10 to the 9th power n/sq cm. After fluences of 10 to the 10th power n/sq cm, the detector resolutions were all affected, and replacement would be required in most gamma ray spectrometry; these results are consistent with previous damage studies on germanium detectors. Considerable variability in neutron damage threshold between detectors was observed within this fluence range which must be attributable to a material parameter that is not yet fully determined. Author (NSA)

N75-25694# Brookhaven National Lab., Upton, N.Y.
TWO DIMENSIONAL POSITION SENSITIVE DETECTOR FOR THERMAL NEUTRONS
J. Alberi, J. Fischer, V. Radeka, L. C. Rogers, and B. Schoenborn
Dec. 1974 25 p refs Presented at Nucl. Sci. Symp., Washington, D. C., 11 Dec. 1974 Submitted for publication Sponsored by ERDA
(BNL-19487; Conf-741213-11; Conf-741212-11) Avail: NTIS HC $3.25

A thermal neutron, two-dimensional position-sensitive detector was developed and tested for use in neutron scattering from biological samples. The detector is based on a multiwire proportional concept with a gas filling of 6 atm He-3, 4 atm A, and 0.5 atm CO2. The position readout uses a resistive wire with charge division to determine position. A resolution of less than 3 mm (FWHM) was measured with a detection efficiency of 70% at 2.8 A neutrons. Considerations leading to an optimal configuration are discussed. Author (NSA)

N75-25695# Battelle Pacific Northwest Labs., Richland, Wash.
[STRONTIUM FLUORIDE RESEARCH IN HEAT SOURCE AND COMPATIBILITY TESTS] Monthly Report on Space Nuclear Systems, Jul. 1974
H. T. Fullam Jul. 1974 14 p
(Contract AT(45-1)-1830)
(BNWL-1845-2) Avail: NTIS HC $3.25

At Hanford, strontium was separated from the high-level waste, then converted to the fluoride, and doubly encapsulated in small, high-integrity containers for subsequent long-term storage. The fluoride conversion, encapsulation, and storage place in the waste encapsulation and storage facilities (WESF). This encapsulated strontium fluoride represents an economical source of Sr-90 if the WESF capsule can be licensed for heat source applications under anticipated use conditions. The objectives of this program are to obtain the data needed to license Sr-90F2 heat sources and specifically the WESF Sr-90f2 capsules. Progress is reported on the following areas of research: SrF2 compatibility tests; SrF2 dissolution rates in aqueous media; SrF2 physical property measurements; WESF Sr-90f2 capsule analysis; thermodynamic analysis of Sr-90f2 compatibility; and SrF2 compatibility program plan. NSA

N75-25696# Battelle Pacific Northwest Labs., Richland, Wash.
[STRONTIUM HEAT SOURCE DEVELOPMENT PROGRAMS] Monthly Report on Space Nuclear Systems Programs Oct. 1974
H. T. Fullam Oct. 1974 29 p refs
(BNWL-1845-4) Avail: NTIS HC $3.75

At Hanford, strontium was separated from the high-level waste, then converted to the fluoride, and doubly encapsulated in small, high-integrity containers for subsequent long-term storage. The fluoride conversion, encapsulation, and storage took place in the waste encapsulation and storage facilities (WESF). This encapsulated strontium fluoride represents an economical source of Sr-90 if the WESF capsule can be licensed for heat source applications under anticipated use conditions. The objectives of this program are to obtain the data needed to license Sr-90F2 heat sources and specifically the WESF Sr-90F2 capsules. Progress on the following areas of research is reported: short-term compatibility tests, SrF2 dissolution rate studies, thermodynamic analysis of Sr-90F2 compatibility, and the Sr-90F2-tungsten system. NSA

N75-25697# Illinois Univ., Urbana. Dept. of Physics.
THE DECK MODEL APPLIED TO BARYONIC SYSTEMS
R. T. Cutler and H. W. Wyld, Jr. May 1975 52 p refs
(Contract AT(11-1)-1195; Grant NSF MPS-73-05103-A01)
(ILL-(TH)-75-11; COO-1195-302) Avail: NTIS HC $4.25 CSCL 20H

Reggeized deck model calculations are performed for the reactions proton antiproton approaches the limit of proton antiproton positive pion negative pion, proton proton approaches the limit of proton proton positive pion negative pion, and proton proton approaches the limit of proton X. The calculations are compared with an experiment at 25 and 40 GeV for the first reaction and with high energy data for the other two reactions. Author

N75-25698# Montpellier Univ. (France). Dept. de Physique Mathematique.
CONSTRUCTION OF THE SCATTERING AMPLITUDE FROM THE ELASTIC CROSS SECTION AT A GIVEN ENERGY
P. C. Sabatier Jul. 1974 36 p refs Presented at the Am. Mathematical Soc. Summer Seminar on Inverse Probl., Los Angeles, 5-14 Aug. 1974
(PM/74/8) Avail: NTIS HC $3.75

The problem of constructing the scattering amplitude is reviewed for the case of spin zero elastic scattering. Suggestions are given as to proper use of phase shift analysis methods, and the links between existence, uniqueness, and stability are emphasized. ESRO

N75-25699# Ballistic Research Labs., Aberdeen Proving Ground, Md.
CROSS SECTIONS FOR FORWARD-ANGLE ELASTIC SCATTERING OF 7.55 MeV NEUTRONS: A SURVEY Final Report
C. E. Hollandsworth, W. P. Bucher, J. Youngblood, and A. Niiler
Mar. 1975 26 p refs
(DA Proj. 1W1-62118-AH-75)
(AD-A008014; BRL-1764) Avail: NTIS CSCL 20/8

Forward-angle neutron elastic-scattering cross sections for Be, C, Al, Fe, Cu, Sn, and W at 7.55 MeV incident neutron energy are presented. The data are compared with both the ENDF/B III evaluations and optical model calculations. In the latter case good agreement between experiment and calculation is obtained for Al, Fe, Cu, and Sn when the Wilmore-Hodgson parameters are used in the optical-model calculation. Reasonably good agreement is found between the data and ENDF/B III, except for carbon and copper. GRA

N75-25700# Battelle Columbus Labs., Ohio.
A STUDY OF IN-REACTOR DENSIFICATION OF UO2 FUEL IN THE MH-1A REACTOR Final Report
V. W. Storhok 23 Dec. 1974 45 p
(Contract W-7405-eng-92)
(AD-A008052) Avail: NTIS CSCL 18/10

Density data obtained by a mercury pycnometry technique provided conclusive evidence that the UO2 fuel in the MH-1A Reactor densified during operation. On the basis of optical metallographic observations, the densification occurred by annihilation of small as-fabrication porosity. The fuel densification did not result in any obvious decrease in the integrity of the fuel rods or the fuel assembly. GRA

N75-25701# R and D Associates, Santa Monica, Calif.
ANALYSIS OF THE RESPONSE OF A CONDUCTOR IMMERSED IN AN EMP SOURCE REGION: THE STEADY STATE
Charles T. C. Mo 24 Jan. 1975 49 p refs
(DNA001-72-C-0197; DNA Proj. NWED-DB-001)
(AD-A008368; RDA-TR-2301-009; DNA-3455T) Avail: NTIS CSCL 18/3

This report addressed the problem of a conducting body immersed in air and illuminated by a gamma-ray flux. In this EMP source coupling region, the charge, the current, and the field at the conducting body are of interest. A scheme was formulated for solving this problem by carefully decomposing the interaction into its various basic aspects concerning the effects of the incident gamma-rays only, of the driving Compton electron current, and of the ionized air conductivity. The effects are examined both separately and in combination. The author solves a simple case involving an infinitely-conducting and infinitely-dense spheroidal conductor illuminated by a steady stream of gamma-rays. This solution provides physical insights into the EMP source region effects and illustrates the scheme of theoretical analysis for more complex problems. Numerical results are developed for illustrative high altitude EMP exposures. Finally, a scheme is outlined to solve the time-dependent problem by extending the above method. GRA

N75-25702# Naval Nuclear Power Unit, Fort Belvoir, Va.
OPERATING REPORT FOR RADIOISOTOPIC POWER GENERATORS OF THE US NAVY. VOLUME 8, NUMBER 1 Report, 1 Jan. - 30 Sep. 1974
30 Sep. 1974 96 p

(AD-A008191) Avail: NTIS CSCL 18/14

The objective of this Operating Report is to serve as a vehicle for the accumulation and dissemination of information concerning the application and operation of radioisotopic power generators (RPGs) within the Navy. It will be noted that all RPGs presently listed are radioisotope thermoelectric generators (RTGs). Unless specifically identified as an engineering evaluation, items contained in this report are presented as an impartial collection of facts, observations and other information. GRA

N75-25703# Naval Ordnance Lab., White Oak, Md.
EVALUATION OF THE REXCO-H AND REXCO-HEP REACTOR EXCURSION CONTAINMENT CODES Final Report, Apr. 1972 - Jun. 1974
Richard A. Lorenz 14 Mar. 1975 47 p refs
(Contract AT(49-1)-3118)
(AD-A008140; NOLTR-74-63) Avail: NTIS CSCL 18/9

The REXCO-H and REXCO-HEP Reactor EXcursion COtainment codes have been developed by Argonne National Laboratory. These codes analyze the response of the primary containment system of a liquid metal fast breeder reactor to a core disassembly accident (CDA). REXCO-H analyzes the Hydrodynamic response, and REXCO-HEP analyzes the Hydrodynamic and Elastic-Plastic response. The author has completed an extensive and detailed analysis of the theory and the programming of the REXCO-H containment code, Release 2, and of the REXCO-HEP containment code, Release 1. This report presents the findings of this investigation: several programming errors have been discovered and corrected; the effects of the inherent shortcomings in the programmed models are discussed; suggestions are made for future improvements; and evaluations are given for the individual sections of the codes and for each code as a whole. GRA

N75-25704# Army Electronics Command, Fort Monmouth, N.J.
TEST MODELS OF TACTICAL DOSIMETERS IM185 AND IM188
Stanley Kronenberg Mar. 1975 28 p refs
(AD-A008317; ECOM-4298) Avail: NTIS CSCL 06/18

Tactical Dosimeters IM185 (Army version) and IM188 (Air Force version) are used to measure total doses of gamma rays and fast neutrons delivered at low rates as well as at extremely high rates, which correspond to the radiation from fallout and the prompt initial radiation from tactical nuclear weapons, respectively. This report describes techniques developed to alleviate the difficulties encountered in the use and maintenance of previous test models. GRA

N75-25705# Electric Power Research Inst., Palo Alto, Calif.
BREEDER BENEFITS AND URANIUM ORE AVAILABILITY
Alan S. Manne and S. Yu. Oliver 1 Oct. 1974 38 p refs
(PB-239513/5; EPRI-SR-3) Avail: NTIS HC $3.75 CSCL 18I

This paper deals with the relation between economic benefits of the breeder and the availability of uranium ore resources. The model was constructed around a future role of the fast breeder reactor (FBR) in a mix of nuclear, coal, and other possible advanced concept power systems. Only a small number of variations was calculated, making assumptions on the cost of uranium, the discount rate for R and D investments, etc. It is recommended that, as backup to the FBR, the nation should develop and environmentally acceptable coal utilization technology. GRA

74 OPTICS

Includes light phenomena.

N75-25706* National Aeronautics and Space Administration, Washington, D.C.
PHYSICAL CORRECTION FILTER FOR IMPROVING THE OPTICAL QUALITY OF AN IMAGE Patent
Shui Yee Lee, inventor (to NASA) (Bellcomm, Inc.) Issued 13 May 1975 12 p Filed 16 Jul. 1971 Supersedes N72-21663 (10 - 12, p 1642) Sponsored by NASA
(NASA-Case-HQN-10542-1; US-Patent-3,883,436;
US-Patent-Appl-SN-163151; US-Patent-Class-250-566;
US-Patent-Class-178-DIG.25; US-Patent-Class-350-311) Avail: US Patent Office CSCL 20F

A family of physical correction filters is described. Each filter is designed to correct image content of a photographed scene of limited resolution and includes a first filter element with a pinhole through which light passes to a differential amplifier. A second filter element through which light passes through one or more openings, whose geometric configuration is a function of the cause of the resolution loss included. The light, passing through the second filter element, is also supplied to the differential amplifier whose output is used to activate an optical display or recorder to reproduce a photograph or display of the scene in the original photograph or display of the scene in the original photograph with resolution which is significantly greater than that characterizing the original photograph.
Official Gazette of the U.S. Patent Office

N75-25707# Joint Publications Research Service, Arlington, Va.
EFFECT OF SEA SURFACE ROUGHNESS ON VISIBILITY OF UNDERWATER OBJECTS
Yu.-A. R. Mullamaa 23 Jun. 1975 10 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Fiz. Atmosfery Okeana (Moscow), v. 11, no. 2, 1975 p 199-206
(JPRS-64843) Avail: NTIS HC $3.25

The dependence was studied of the visibility of underwater objects on the zenith viewing angle, surface roughness, submergence of the object, and the height of the observation point. Scattering functions, energy distribution in the marginal image, and the frequency-contrast transfer function were used for studying the sea surface from the viewpoint of the transmitting properties of the underwater object's image. As the height of the observation point increases, the clarity of the image was found to increase. The required averaging of the brightness pattern, adequate to obtain a stable nonfluctuating image, was evaluated. Author

N75-25708*# Honeywell, Inc., Lexington, Mass. Radiation Center.
LK39F1 S/N U-1 INFRARED DETECTOR Final Report
Apr. 1975 19 p
(Contract NAS9-14180)
(NASA-CR-141858; HONEYWELL-22146-1) Avail: NTIS HC $3.25 CSCL 20F

A multilayered (Hg,Cd)Te detector is described with three infrared bands. Nominal cut-off wavelengths for each band are as follows: (1) Channel 1 - 3 microns, (2) Channel 2 - 6 microns, and (3) Channel 3 - 11 microns. The multilayered detector is mounted in a Honeywell LK39 glass dewar. Accompanying the detector/dewar assembly is a three-channel preamplifier package capable of switching each detector to the single channel input of the HRB Singer Reconfax 4 Mark 4 Infrared Scanner. Author

N75-25709*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
OPTIMUM CONSTRAINED IMAGE RESTORATION FILTERS
T. E. Riemer and C. D. McGillem 1974 213 p refs
(Contract NAS9-14016; Grant NGL-15-005-112)
(NASA-CR-141852; LARS-IN-091974) Avail: NTIS HC $7.25 CSCL 20F

The filter was developed in Hilbert space by minimizing the radius of gyration of the overall or composite system point-spread function subject to constraints on the radius of gyration of the restoration filter point-spread function, the total noise power in the restored image, and the shape of the composite system frequency spectrum. An iterative technique is introduced which alters the shape of the optimum composite system point-spread function, producing a suboptimal restoration filter which suppresses undesirable secondary oscillations. Finally this technique is applied to multispectral scanner data obtained from the Earth Resources Technology Satellite to provide resolution enhancement. An experimental approach to the problems involving estimation of the effective scanner aperture and matching the ERTS data to available restoration functions is presented. Author

N75-25710*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SCATTER OF OBLIQUELY INCIDENT PLANE WAVES FROM A CORRUGATED CONDUCTING SURFACE

David N. Levine Apr. 1975 20 p refs Submitted for publication
(NASA-TM-X-70913; X-952-75-144) Avail: NTIS HC $3.25 CSCL 20F

A physical optics solution is presented for the scattering of plane waves from a perfectly conducting corrugated surface in the case of waves incident from an arbitrary direction and for an observer far from the surface. This solution was used to compute the radar cross section of the surface in the case of backscatter from irregular (i.e., stochastic) corrugations and to point out a correction to the literature on this problem. A feature of the solution is the occurrence of singularities in the scattered fields which appear to be a manifestation of focussing by the surface at its stationary points. Whether or not the singularities occur in the solution depends on the manner in which one restricts the analysis to the far field. Author

N75-25711# Sandia Labs., Albuquerque, N.Mex.
THEORY OF AN ELECTROOPTIC ACCELEROMETER
R. A. Damerow and G. W. Smith Dec. 1974 15 p refs
(Contract AT(29-1)-789)
(SAND-74-0321) Avail: NTIS HC $3.25

The nonrelativistic theory of a measurement technique which uses both optical interferometry and electronic delay differentiation to produce a measurement of the acceleration of a moving surface is described. This technique is particularly suitable for acceleration measurements in the 10 to 100 kilo g range. The theory stresses the phase relations between the interfering signals, both optical and electronic, and clearly displays the approximations which are made to develop the final working equations. This approach provides a systematic means of analyzing such systems and provides insight into proper application of the Doppler equation. In particular, it is shown that phase analysis leads to exactly the relativistic Doppler equation evaluated at times retarded by the time required for light to propagate from the moving surface to the detector. An analysis of the inherent errors of such a system is performed, and it is shown that they may be estimated using only the measured average acceleration, its time derivative, and the net electronic delay time.
Author (NSA)

N75-25712# Pennsylvania State Univ., University Park. Materials Research Lab.
SELECTION, SYNTHESIS, GROWTH AND CHARACTERIZATION OF POTENTIAL 10.6 MICRON WINDOW MATERIALS Final Report, 16 Aug. 1971 - 16 Aug. 1974
William B. White and Rustum Roy 15 Dec. 1974 24 p refs
(Contract F19628-71-C-0232; AF Proj. 5620)
(AD-A008495; AFCRL-TR-74-0618) Avail: NTIS CSCL 20/6

A systematic search has been made for ternary and more complex materials that could serve as new 10.6 micrometer IR windows. A literature survey of chalcogenide materials allowed the sorting of more than 1000 ternary compounds into structurally-related families. From these were selected the spinel structure, the Th3P4 structure, the calcium ferrite structure, and the As-Sb-Bi-Pb-Ag-S system for experimental investigation. On the order of 100 compounds were synthesized and their melting behavior, stability under atmospheric ambients, and vibrational spectra were determined. A systematic investigation of all known alkali halide systems reveals no ternary compounds or combination of binary compounds that appear to be superior to the alkali halide window materials already in use. Complex oxides of bismuth with other metals, most importantly lead, are cubic but have vibrational frequencies too high for their consideration as IR windows. GRA

N75-25713# Pennsylvania State Univ., University Park. Materials Research Lab.
INFRARED PROPERTIES OF MIXED LEAD-BISMUTH OXIDES
Regis J. Betsch and William B. White 30 Sep. 1974 29 p refs
(Contract F19628-71-C-0232; AF Proj. 5620)
(AD-A008494; SR-8; AFCRL-TR-74-0623) Avail: NTIS CSCL 20/6

Five bismuth compounds with the cubic sillenite structure (I23), Bi12SiO20, Bi12GeO20, Bi12TiO2, Bi12ZnO19 and Bi12PbO19 were synthesized. Infrared and Raman spectra of these compounds and of Bi2O3 with and without N:O were measured. It is shown that fundamental mode frequencies in these covalent oxides are surprisingly high and that hope for an oxide window material has become vanishingly small. GRA

N75-25714# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.
OPTICAL MATERIALS CHARACTERIZATION Semiannual Technical Report, 1 Jul. - 31 Dec. 1974
Albert Feldman, Deane Horowitz, Roy M. Waxler, Irving Malitson, and Marilyn J. Dodge Jan. 1975 18 p refs
(ARPA Order 2620)
(COM-75-10135/2; NBSIR-75-639) Avail: NTIS HC $3.25 CSCL 20E

The following parameters of chemical vapor deposited polycrystalline ZnSe were measured: (1) refractive index and change of index of refraction with temperature using the method of minimum deviation; (2) the coefficient of linear thermal expansion using Fizeau interferometry; and (3) the elastic moduli and photoelastic moduli using Fizeau and Twyman-Green interferometry. A sensitive technique was developed for measuring stress-optical constants of materials that exhibit a small stress-optical effect. GRA

N75-25715# Metavac, Inc., Flushing, N.Y.
PRODUCTION ENGINEERING MEASURE FOR FILTER, INFRARED, INTERFERENCE-ABSORPTION TYPE Quarterly Report, 1 Sep. - 30 Nov. 1974
John Monte 10 Jan. 1975 29 p
(Contract DAAB07-74-C-0379)
(AD-A008033; QR-2) Avail: NTIS CSCL 20/6

The program was devoted to selection, test and adjustment of a suitable multilayer coating to form the required interference filter. A thirteen layer coating, consisting of alternate layers of very high and moderately low index of refraction materials, was selected from several coating types which have been made in the past for similar applications. Adjustments were made to the preparation of the glass, application of the multilayer coating, and to the tools and test apparatus used for making these filters. The manufacturing procedure and tools are in the process of being adjusted to final form, suitable for making Engineering Samples. GRA

N75-25716# Perkin-Elmer Corp., Norwalk, Conn.
DIFFRACTION GRATING DEVELOPMENT Final Report, 13 Jun. 1973 - 15 Jul. 1974
J. S. Harris, A. F. Slomba, R. Arnold, J. Bartas, and G. Campe Jul. 1974 189 p refs
(Contract F29601-73-A-0040; AF Proj. 317J)
(AD-A008199; PE-11991; AFWL-TR-74-218) Avail: NTIS CSCL 20/6

Grating samples for use as laser beam samplers were produced and tested for evaluation of various production methods and analytical solutions of grating diffraction. The grating samples were tested for scatter, absorptance, microscopic surface quality, sample wavefront quality, and variation of diffraction efficiency with polarization. Both ruling and ion etching were shown to produce good grating samples and used to produce gratings on large metal mirrors. Two large ruled gratings were experimentally evaluated as a series grating wavefront sampler. A series grating wavefront sampler was evaluated analytically for misalignment errors and high-power laser thermal effects.
GRA

N75-25717# Honeywell, Inc., Minneapolis, Minn. Government and Aeronautical Products Div.
PLZT (LIGHT VALVE PROJECTOR DISPLAY) Final Report, 29 Jun. 1973 - 16 Jul. 1974
Aida Khalafalla, Dan Burbank, and Allen Rose Jan. 1975 40 p refs
(Contract F33615-73-C-1083; AF Proj. 2003)
(AD-A008281; Rept-40012-FR; AFAL-TR-74-344) Avail: NTIS CSCL 20/6

The objectives of this program were to investigate the electro-optic, dielectric, and piezoelectric properties of various PLZT compositions as they relate to display devices. Two PLZT compositions were studied to determine their display related characteristics: 7/65/35, and 12/40/60. Large and small grain samples were investigated. The results of this investigation showed that none of these PLZT compositions were suitable for multiformat displays. GRA

N75-25718# Union Carbide Corp., San Diego, Calif. Crystal Products Dept.
DEVELOPMENT OF OPTIMIZED QUALITY BARIUM SODIUM NIOBATE CRYSTALS Final Report, Nov. 1973 - Oct. 1974
L. R. Rothrock and H. D. Quandt Jan. 1975 53 p refs
(Contract F33615-74-C-1032; AF Proj. 2001)
(AD-A007977; AFAL-TR-74-348) Avail: NTIS CSCL 20/6

Barium sodium niobate, Ba2NaNb5O15 or banana, has been known for some years to be the most effective nonlinear optical material available for second harmonic generation. It has a large nonlinear electro-optic coefficient and a high optical damage threshold. Banana is a logical choice for use as a frequency doubler (1.06 micrometers to 0.53 micrometers) for laser transmitters in such applications as space laser communications systems. However, banana is an extremely difficult crystal to grow. The objective of this program was to improve growth techniques so that crystals of optimized quality could be produced. Barium sodium niobate crystals with high optical quality and low coefficient of absorption were developed. Characterization techniques applied to these crystals are described. GRA

N75-25719# Arizona Univ., Tucson. Optical Sciences Center.
FIRST QUARTER FY75 APPLIED OPTICS RESEARCH REPORT Quarterly Report, 1 Jul. - 30 Sep. 1974
P. A. Franken Oct. 1974 69 p refs
(Contract F04695-67-C-0197)
(AD-A008279; SAMSO-TR-75-67) Avail: NTIS CSCL 20/6

The University of Arizona Optical Sciences Center presents results of work in mathematical optics, quantum optics, thermal expansion and dimensional stability and image processing. Also included is a list of professional publications and activities of Optical Sciences Center personnel. GRA

N75-25720# Manlabs, Inc., Cambridge, Mass.
ELASTIC CONSTANT MEASUREMENTS OF POLYCRYSTALLINE INFRARED WINDOW MATERIALS Interim Report
S. Andrew Kulin, Richard Salzbrenner, and Peter P. Neshe 1 Dec. 1974 22 p refs
(Contract F19628-73-C-0051; AF Proj. 5620)
(AD-A007973; SR-2; AFCRL-TR-75-0151) Avail: NTIS CSCL 20/6

In this work elastic constants of some infrared window materials were calculated from ultrasonic measurements using a pulse overlap technique. Velocity measurements were determined in various directions in CVD zinc selenide and in hot forged KCl alloy windows. These measurements permitted the determination of Young's Modulus, the shear modulus, the bulk modulus, and Poisson's Ratio. Some anisotropy was found in the elastic properties of these fabricated or as-grown infrared windows. For example, in the case of the chemically vapor deposited ZnSe which exhibits a small amount of elastic anisotropy, the elastic properties were found to be isotropic in all directions normal to the growth direction. The modulus values observed for directions in the plane of the zinc selenide window were found to change by approximately two percent when measured in directions parallel to the plate growth direction. The experimental results obtained were, in some cases, compared with various calculation approximations which yield polycrystalline elasticity parameters from single crystal data. GRA

N75-25721# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
STAR TRACKER/MAPPER: SYSTEM DESIGN PARAMETERS
F. W. Schenkel Sep. 1974 67 p refs
(Contract N00017-72-C-4401)
(AD-A008554; APL-JHU-TG-1256) Avail: NTIS CSCL 22/1

This document treats a variety of topics which must be considered by the designer of a star sensor system. The intent of the document is to consolidate these factors and relate their interdependence to provide an orderly design procedure. An attempt is made to relate the star sensor design to its specific application, whether satellite or earth-based. Among the topics discussed are general systems considerations, star characteristics, atmospheric effects, optics and photometry, and available sensor types. The prospective designer is alerted to avoid the many pitfalls which he might encounter. Specific systems concepts are not discussed since the referenced literature serves to accomplish this in an adequate manner. GRA

N75-25722# George Washington Univ., Washington, D.C. School of Engineering and Applied Science.
THE CHANGE OF OPTICAL ACTIVITY IN CHOLESTERIC LIQUID CRYSTALS
James D. Lee and Harold Liebowitz Feb. 1975 36 p refs
(Contract N00014-67-A-0214-0018)
(AD-A008577) Avail: NTIS CSCL 20/6

The molecular structure and the optical properties of cholesteric liquid crystals are discussed. Under external influences the molecular structure, characterized by coefficient of optical activity, changes and so does the color of cholesteric liquid crystals. These are analyzed theoretically with the hope to find out the possibility and limitation of applying cholesteric liquid crystals to the field of fracture mechanics. GRA

N75-25723# Army Foreign Science and Technology Center, Charlottesville, Va.
EXPERIMENTAL INVESTIGATION OF THE POSSIBILITY OF IMPROVING THE SENSITIVITY OF PHOTOCELLS USING FIBER AMPLIFIERS
I. F. Balashov, E. G. Bondarenko, B. A. Ermakov, and V. N. Popov 31 Jul. 1974 7 p refs Transl. into ENGLISH from Opt.-Mekhan Prom. (USSR), no. 4, 1973 p 20-22
(AD-A008342; FSTC-HT-23-0044-74) Avail: NTIS HC $3.25 CSCL 20/6

Investigation into the sensitivity of photocells was made by using fiber amplifiers. A core with a diameter of 30 micrometers and a casing, made from samarium glass with a diameter of 1 mm was used as an amplifier. Tests showed that a sensitivity was reached with limits of 10 to the minus 8th power W with a 30 MHz band. GRA

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N75-25724*# Princeton Univ., N.J. Dept. of Aerospace and Mechanical Sciences.
PULSED ELECTROMAGNETIC GAS ACCELERATION Semiannual Report, 1 Jul. - 31 Dec. 1974
Robert G. Jahn, Woldemar F. VonJaskowsky, and Kenn E. Clark Jan. 1975 98 p refs
(Grant NGL-31-001-005)
(NASA-CR-142904; SAR-634x) Avail: NTIS HC $4.75 CSCL 20I

Terminal voltage measurements with long cathodes in a high power, quasi-steady MPD discharge show that the critical current for the onset of voltage fluctuations, which was previously shown to be a function of cathode area, approaches an asymptote for cathodes of very large surface area. Floating potential measurements and photographs of the discharge luminosity indicate that the fluctuations are confined to the vicinity of the cathode and hence reflect a cathode emission process rather than a fundamental limit on MPD performance. Photoelectric measurements of particular argon neutral and ion transitions show that the higher electronic states are populated more heavily than would be calculated on the basis of Saha-Boltzmann equilibrium at the local electron temperature and number density. Preliminary optical depth measurements show that for a current of 4 kA and an argon mass flow of 12 g/sec, a population inversion exists between the upper and lower states of the 4880 A argon ion transition. Author

N75-25725# Joint Publications Research Service, Arlington, Va.
RESEARCH IN MAGNETOHYDRODYNAMICS
11 Jun. 1975 25 p refs Transl. into ENGLISH from Magnitnaya

Gidrodinamika (Riga), no. 1, 1975 p 102-117
(JPRS-64974) Avail: NTIS HC $3.25

The results are presented of research and experiments in the design of magnetohydrodynamic machines with a liquid metal operating element. Electromagnetic pumps and magnetohydrodynamic generators are discussed along with dc conduction and induction multiphase magnetohydrodynamic machines. The parameters are reported of a number of manufactured and extensively operated electromagnetic pumps for pumping potassium, sodium, lithium, mercury, gallium, and their alloys at temperatures of up to 600 C. Research conducted on applied magnetohydrodynamics is summarized. M.J.S.

N75-25726*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CALCULATION OF CURRENT COLLECTED IN A DILUTE PLASMA THROUGH A PINHOLE IN THE INSULATION COVERING A HIGH-VOLTAGE SURFACE
Gustave C. Fralick Washington Jun. 1975 35 p refs
(NASA-TN-D-7957; E-8186) Avail: NTIS HC $3.75 CSCL 20I

A procedure is described for calculating the current collected by a pinhole defect in the insulation covering a high voltage surface. The results apply to a satellite at geosynchronous altitude where the effects of satellite motion and collective plasma effects on the collected current may be ignored. Author

N75-25727# Army Foreign Science and Technology Center, Charlottesville, Va.
X-RAY DURATION DURING DISCHARGE IN A VACUUM
R. B. Baksht, S. P. Vavilov, and M. N. Urbazaev 26 Mar. 1974 7 p refs Transl. into ENGLISH from Izv. Vysshikh Uche Zavedenii, Fiz. (Tomsk), v. 2, no. 129, 1973 p 140-141
(AD-A008244; FSTC-HT-23-1845-73) Avail: NTIS CSCL 20/9

Using a pulsed X-ray tube, the duration of X-ray bursts formed by a discharge in vacuum and the anode-cathode distance in a diode-type tube were studied. The tests indicated the presence of X-rays during the breakdown current build-up and absence of X-rays as the plasma crossed the gap and the discharge changed to the arc mode. Calculations and experiment indicate that X-ray dose is directly proportional to the interelectrode gap. GRA

N75-25728# Army Foreign Science and Technology Center, Charlottesville, Va.
MECHANISM FOR ESTABLISHING STEADY PLASMA TURBULENCE
I. A. Akhiezer and V. V. Angeleiko 22 Mar. 1974 12 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 17, no. 9, 1972 p 1431-1437
(AD-A008246; FSTC-HT-23-1887-73) Avail: NTIS CSCL 20/9

A mechanism for establishing steady plasma turbulence is described. Owing to nonlinear effects, the phase velocity of the plasma wave is modified, proportional to the level of turbulent oscillations. Ion-acoustic oscillations in a strongly magnetized, collision-free plasma containing thermal electrons are considered. GRA

N75-25729# Cornell Univ., Ithaca, N.Y. Center for Applied Mathematics.
STUDIES IN ROTATIONAL FLOWS ESPECIALLY HYDROMAGNETIC Final Report, 1 Sep. 1971 - 31 Oct. 1974
G. S. S. Ludford Nov. 1974 11 p refs
(Grant DA-ARO(D)-31-124-71-G163; DA Proj. 200-61102-B-14C)
(AD-A008416; ARO-5329-70-M) Avail: NTIS CSCL 20/9

Modern asymptotic methods have been used to investigate (1) magnetohydrodynamic duct flow in strong transverse magnetic fields, especially the occurrence of fully developed conditions and inertial effects; (2) the ion probe; (3) hydrodynamic stability, especially magnetohydrodynamic and using a new approach; (4) rotating flows, including stagnation points, almost rigid rotation, and vortex breakdown; (5) viscous boundary layers in shear flow, especially past a flat plate and the inlet problem; (6) diffusion and reversed convection of heat, as it sheds light on the asymptotics of singular elliptic equations; (7) combustion, in particular the burning of a liquid-fuel droplet and the decomposition of a monopropellant droplet. GRA

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N75-25730* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RADIATION HARDENING OF MOS DEVICES BY BORON Patent
Vitaly Danchenko, inventor (to NASA) Issued 6 May 1975 5 p Filed 4 Sep. 1973 Supersedes N73-32114 (11 - 23, p 2764) Continuation-in-part of US Patent Appl. SN-206266, filed 9 Dec. 1971
(NASA-Case-GSC-11425-2; US-Patent-3,882,530; US-Patent-Appl-SN-394206; US-Patent-Class-357-23; US-Patent-Class-357-29; US-Patent-Class-357-42; US-Patent-Class-357-52; US-Patent-Class-357-54; US-Patent-Class-357-91; US-Patent-Appl-SN-206266) Avail: US Patent Office CSCL 20L

A technique is described for stabilizing the gate threshold potential at room temperature of a radiation subjected MOS field effect device with a semiconductor substrate, and insulating layer of oxide on the substrate, and a gate electrode disposed on the insulating layer. Boron is introduced into the insulating oxide immediately adjacent the semiconductor-insulator interface. The concentration of boron in the oxide layer is maintained at 10 atoms/cu cm. Radiation induced positive gate charge accumulations which would cause shifting of the gate threshold potential of a radiation subjected MOS device, and render the device unstable and inoperative are reduced.
Official Gazette of the U.S. Patent Office

N75-25731 British Library Lending Div., Boston Spa (England).
CONTRIBUTION TO THE STUDY OF IRRADIATION DEFECTS CREATED IN GOLD BY ELECTRONS
Marie-Odile Ruault and M. Bernard Jouffrey 15 Aug. 1974 6 p refs Transl. into ENGLISH from G. R. Acad. Sci. (Paris), v. 275, Ser. B, 25 Sep. 1972 p 451-454
(BLL-CE-Trans-6345-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Electron irradiation experiments were carried out at room temperature, on the polycrystals of 99.999% pure gold (previously annealed at 1000 C for 10hr), and polycrystals of gold quenched in brine from a temperature slightly above 1000 C, then annealed at 100 C for 1hr (so that they should contain a high density of stacking fault tetrahedra). The specimens, thinned electrolytically, were observed with the laboratory's 3.5 MV electron microscope. During this study, the electron microscope was used initially, at voltages between 1 and 1.5 MV, and later at voltages between 2 and 3 MV (2, 2.5 and 3 MV). For a (100) sample orientation, the formation of perceptible defects is possible when the energy of the electrons is approximately 1.3 MV. This corresponds to a displacement energy for the gold atoms of approximately 33 eV using the conventional transfer formula. Author

N75-25732# Pisa Univ. (Italy).
NEW QUANTUM AND ELECTRONIC THEORY OF METAL-SEMICONDUCTOR CONTACTS
B. Pellegrini [1973] 15 p refs Repr. from Phys. Rev., B, v. 7, no. 12, 15 Jun. 1973 p 5299-5312
(Rept-1461) Avail: NTIS HC $3.25

The Schottky, Davydov, Bardeen, and Heine theories of metal-semiconductor contacts are improved by using a new general expression for the junction capacitance and by accounting for quantum-mechanical tunneling of free electrons from the metal into the semiconductor's forbidden energy gap. The Poisson equation for electric field and potential is first solved to obtain general expressions for the junction capacitance, the built-in voltage on the junction capacitance, and the barrier height. The electron wave function is then calculated using effective-mass and WKB approximations and the continuity of probability density and current at the metal-semiconductor interface. Finally, the density of states of electrons which tunnel from the metal into the semiconductor's forbidden energy gap is deduced from the electron wave function. In practice, these calculations are intradependent and cannot be completely separated. For metal-n-type semiconductor contacts, the most significant differences between this theory and previous theories are the increases of both the energy barrier height and the built-in voltage of the contact capacitance. For metal-p-type semiconductor contacts, tunneling of electrons from the metal to the semiconductor reduces the barrier height and width and built-in voltage of the contact capacitance. As a consequence, the hole-tunneling probability and reverse current are both increased. The results agree with published experimental measurements of capacitance, photoemission, and current. Author

N75-25733# Northwestern Univ., Evanston, Ill. Dept. of Materials Science.
EFFECT OF POINT DEFECTS ON MECHANICAL PROPERTIES IN METALS Technical Progress Report, 1 Jan. - 31 Dec. 1974
M. Meshii 31 Dec. 1974 11 p refs
(Contract AT(11-1)-1367)
(COO-1367-62) Avail: NTIS HC $3.25

Attention was directed toward the effect of electron irradiation on the plastic deformation of iron single crystals. The orientation dependence of the irradiation softening was extensively investigated. The investigation of the microyielding behavior of irradiated iron was completed and written up. The results supplemented the macroyielding results and revealed interesting dislocation activity in the pre-macroyielding region. A number of observations regarding electron irradiated iron and the mechanism determining the strength of iron were organized and reported. The effect of carbon atoms was also investigated in iron to compare the effect of self-interstitials produced by electron irradiation. The dislocation motion was studied over a temperature range between 4.2 and 100 K in copper single crystals irradiated at 100 K; the emphasis was to examine how the dislocation motion revealed by etch pits correlates with the macroscopic stress-strain relation. Author (NSA)

N75-25734# California Univ., Berkeley. Lawrence Berkeley Lab.
LITHIUM-DIFFUSED n(+) CONTACTS ON HIGH-PURITY GERMANIUM: HOW THIN CAN THEY BE MADE, HOW STABLE ARE THEY
R. H. Pehl and R. C. Cordi Dec. 1974 4 p refs Presented at the Nucl. Sci. Symp., Washington, D. C., 11 Dec. 1974
(Contract W-7405-eng-48)
(LBL-3630; Conf-741213-9) HC $3.25

A Li-diffused n(+) surface layer is the best n(+) contact developed up to the present time. However, the effective dead layer resulting from the Li-diffusion prevents the optimum stacking of detectors for counter telescopes. Diffusion temperatures as low as 160 C have been successfully used to produce effective dead layers as thin as 10 micron. Unfortunately, these dead layers increase significantly when the detector is annealed following radiation damage. Author (NSA)

N75-25735# Commissariat a l'Energie Atomique, Saclay (France). Dept. de Transfert et Conversion d'Energie.
TO REDUCE GRAIN GROWTH OF LaCrO3 HEATING ELEMENTS IN 1700 TO 1850 C TEMPERATURE RANGE, THE INFLUENCE OF SOME ADDITIONS HAVE BEEN STUDIED BY HEAT TREATMENT IN AIR
R. G. Saint-Jacques Jan. 1975 23 p refs In FRENCH
(CEA-R-4642) Avail: ERDA Depository Libraries HC $4.25

Most of the additions were introduced in aqueous solution form to realize a uniform coating on each particle, and have a homogeneous repartition after calcination; grain growth is reduced by cobalt addition but increased by molybdenum or magnesium addition. Experiments at 1850 C were made in a new type of furnace using LaCrO3 heating element. Microstructure of LaCrO3 heating elements after life tests were studied. Author (NSA)

N75-25736# Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk-River Nuclear Labs.
[RESEARCH PROGRESS IN SOLID STATE, MATERIALS SCIENCE, AND GENERAL AND PHYSICAL CHEMISTRY] Progress Report, 1 Jul. - 30 Sep. 1974
Oct. 1974 139 p refs
(AECL-5014) Avail: ERDA Depository Libraries HC $10.00; Atomic Energy of Canada, Ltd., Chalk River $3.00

Results of research conducted in the solid state branch, general chemistry branch, physical chemistry branch, materials science branch, McMaster University, Queens University and University of B.C. are reported. NSA

N75-25737# Illinois Univ., Urbana. Electronics Lab.
EXPERIMENTS ON THE ORIGIN OF PROCESS INDUCED RECOMBINATION CENTERS IN SILICON
C. T. Sah and C. T. Wang 15 Oct. 1974 49 p refs
(Contract F19628-72-C-0199; AF Proj. 5638)
(AD-A008506; UILU-ENG-74-2557; AFCRL-TR-74-0543; SR-2) Avail: NTIS CSCL 20/12

Densities of recombination centers obtained by the transient capacitance technique in diffused p-n junctions and Al-nSi Schottky barriers are correlated with process variables of more than 70 diffusion and heat treatment experiments. Results show that the two process induced donor defect centers reported previously are generated at the strained and disordered silicon surface layers either from high surface concentration phosphorus or boron diffusion or from mechanical lapping. The effects of phosphorus and boron surface concentrations, phosphosilicate surface glass layers and diffusion temperatures on the concentrations of these two centers are investigated. Nearly constant defect concentration profiles at depths more than 50 micrometers from the surfaces are observed, suggesting an L-shaped defect concentration profile in samples with one-sided surface defect source and U-shaped profile for two-sided surface defect sources. These characteristics suggest that the defect centers are vacancies or vacancy complexes formed by vacancies diffused into silicon from the surface sources. GRA

N75-25738# Office of Naval Research, London (England).
INTERNATIONAL CONFERENCE ON VACUUM-ULTRAVIOLET RADIATION PHYSICS
M. Kabler 12 Feb. 1975 11 p ref Conf. held at Hamburg, 22-26 Jul. 1974
(AD-A006992; ONRL-C-3-75) Avail: NTIS CSCL 20/12

This report provides brief accounts of selected talks and sessions of the Fourth International Conference on Vacuum Ultra-Violet Radiation Physics, held in Hamburg, FRG, 22-26 July 1974. The rapid development of this field is attributed to the increased numbers and the availability of synchrotron radiation sources associated with high energy particle machines. It is pointed out that, not only have the numbers of such facilities increased by five-fold in the past decade but storage rings are being built just to provide the synchrotron radiation for VUV studies. Emphasis is placed on photoelectron emission studies, excitron and luminescence effects in both alkali halides and rare gas solids. The studies of core excitons, both theoretically and experimentally were reported at this conference. GRA

N75-25739# Naval Research Lab., Washington, D.C.
COOPERATIVE RADIATION EFFECTS SIMULATION PROGRAM Semiannual Progress Report, 1 May - 31 Oct. 1974
L. E. Steele and E. A. Wolicki Mar. 1975 89 p refs
(NRL Proj. M01-22; NRL Proj. N01-23)
(AD-A008337; NRL-MR-2998) Avail: NTIS CSCL 20/12

This seventh semiannual progress report, covering the period 1 May-31 October 1974, includes progress in: (1) extension of the NRL energy deposition code to high velocity ion bombardments, (2) modification of the NRL energy deposition code to correctly account for range straggling, (3) extension of the Johnson-Gibbons range code to calculate the lateral range of a PKA, (4) an investigation of the effect of ion dose on void and dislocation structures in nickel at elevated temperatures, (5) studies of dose rate effects on void formation and growth in 2.8 MeV nickel-ion-irradiated nickel, (6) studies of the effects of dilute solute elements on the swelling of nickel during nickel ion bombardment, (7) an experiment to investigate irradiation-induced creep of reactor structural alloys by cyclotron bombardment, (8) the electronic control system for the irradiation-induced creep experiment, and (9) the data processing system for the irradiation-induced creep experiment. GRA

N75-25740# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
STRUCTURE AND PROPERTIES OF GLASSY METALS Interim Report
D. Turnbill Mar. 1975 15 p refs
(Contract N00014-67-A-0298-0036; NR Proj. 0320544)
(AD-A008326; TR-4) Avail: NTIS CSCL 20/12

Glassy metals exhibit short range order which is almost as well developed as, but is topologically distinct from, that in crystalline metals. Their defectiveness is due only to the absence of long range spatial correlations of the local configurations. The mechanical and magnetic behavior of glassy metals is interpreted in terms of current structural models, in conjunction with hypotheses concerning dilatational and flow disordering and softening. GRA

N75-25741# Washington Univ., Seattle. Coll. of Engineering.
STUDY OF PHASE TRANSFORMATIONS AND SUPERCONDUCTIVITY Annual Progress Report
S. Begej, W. Jones, F. Prince, Raymond Taggart, and Douglas H. Polonia 15 Oct. 1974 67 p refs
(Contract AT(45-1)-2225-T13)
(RLO-2225-T13-23) Avail: NTIS

Emphasis is on control of microstructure and constitution as a means of improving the physical properties of alloys. An example is found in the magnetization studies of the superconducting Zr-Nb alloys at 4.2 K: Measurement of both T sub C and the magnetic characteristics were found valuable for monitoring the phase transformations in this system. Details of the transformation processes were investigated as a basis for improving the superconducting characteristics of beta-stabilized alloys. Electron microscopy techniques, electrical resistivity, and X-ray analysis were used to study structural modifications resulting from the thermal treatment of Zr-Nb alloys. A combination of deformation, aging, and reversion heat treatments was investigated as a basis for improving the strength and ductility of the beta-stabilized alloy Ti-11.5 Mo-6Zr-4.5Sn. Suitable control over the volume fraction of the omega phase in this alloy results in enhanced yield strength combined with some ductility. NSA

N75-25742# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
PROPERTIES OF HOT FORGED RbCl-KCl ALLOYS OF LOW RUBIDIUM CONCENTRATIONS
N. Klausutis, J. Nikula, J. Adamski, C. Collins, and J. Bruce Jan. 1975 11 p Presented at 4th Ann. Conf. on Infrared Laser Window Mater., Tucson, Ariz., 18-20 Nov. 1974
(AF Proj. 5620)
(AD-A008480; AFCRL-TR-75-0170) Avail: NTIS CSCL 20/12

RbCl doped KCl crystals of five different compositions were grown by the Czochralski method in air and fabricated into forging blanks. These were hot forged to produce fine grained polycrystalline billets. Results of mechanical tests, chemical evaluation and microstructural stability observations are presented. GRA

N75-25743# Pennsylvania State Univ., University Park. Materials Research Lab.
SYNTHESIS AND CRYSTAL CHEMISTRY OF SULFIDES AND TELLURIDES WITH THE Th3P4 STRUCTURE
Paul L. Provenzano and William B. White 30 Aug. 1974 33 p refs
(Contract F19628-71-C-0232; AF Proj. 5620)
(AD-A008490; AFCRL-TR-74-0560; SR-5) Avail: NTIS CSCL 20/6

Chalcogenides, A2BX4, with the Th3P4 structure were identified as potential IR window materials. A crystal chemical evaluation showed that this chalcogenide structure alone is cubic with all cations in 8-fold coordination. Compounds with the formula MLn2S4 (where M = Ca, Sr, Ba, Eu2(+), Pb, and Cd and Ln = La, Ce, Pr, Nd, Sm and Gd) were synthesized by reaction of the oxides or carbonates in flowing H2S at temperatures of 1000-1200 C. The materials were fine grained powders, refractory, and are chemically stable in atmospheric ambient. Band gaps were on the order of 2.5 to 3.0 electron volts when no mixed valence ions were present. Attempts to grow large single crystals by flux and CVD methods were unsuccessful. Author

N75-25744# Pennsylvania State Univ., University Park. Materials Research Lab.
SYNTHESIS OF SULFIDES WITH THE CALCIUM FERRITE STRUCTURE
Larry E. Drafall and William B. White Sep. 1974 36 p refs
(Contract F19628-71-C-0232; AF Proj. 5620)
(AD-A008492; AFCRL-TR-74-0459; SR-6) Avail: NTIS CSCL 20/6

Ternary sulfides with the calcium ferrite structure can be synthesized by reacting the appropriate oxides or carbonates at temperatures of 900 to 1400C in an atmosphere of flowing H2S. Compounds synthesized include SrHo2S4, SrDy2S4, SrTm2S4, SrEr2S4, Eu(2+)Yb2S4, BaNd2S4, BaGd2S4 and BaYb2S4. Compounds were fine grained powders, light colored, and stable in air. They were characterized by measurement of unit cell dimensions and band gap. Precision X-ray powder data are presented. Increase in oxygen activity of the gas stream leads to formation of oxysulfides. Powder data for the oxysulfides are also presented. No single crystals could be grown in spite of repeated attempts by a variety of CVD, hydrothermal and flux techniques. GRA

N75-25745# North Carolina State Univ., Raleigh. Operations Research.
A NOTE ON KAIMANN'S COEFFICIENT ON NETWORK COMPLEXITY
Salah E. Elmaghraby and Willy Herroelen Feb. 1975 13 p refs Sponsored in part by NSF
(Contract N00014-70-A-0120-0002; Grant DA-ARO(D)-31-124-72-G106)
(AD-A008235; NCSU-OR-101) Avail: NTIS CSCL 12/2

The coefficient of network complexity suggested by Kaimann is questioned. Several alternative measures of complexity are offered. GRA

N75-25746# Michigan Univ., Ann Arbor.
THERMAL NEUTRON RADIATION EFFECTS IN II-VI COMPOUNDS Final Technical Report, 1 Nov. 1971 - 1 Nov. 1973
Chihiro Kikuchi and Chad-Yang Huang Nov. 1974 45 p refs
(Contract F33615-72-C-1189; AF Proj. 7885)
(AD-A008177; ARL-74-0143) Avail: NTIS CSCL 20/12

In this project, the double acceptor center in neutron irradiated CdTe was studied. The variation of resistivity as a function of time was measured. The analysis of our experimental results suggests that (a) the double acceptor center includes Te-vacancy, (b) the height of the barrier is about 0.25 eV, (c) the effective range of the potential barrier is about 200A, and (d) the activation energy of motion of interstitial cadmium is estimated to be 0.74 eV. It is known that CdTe is an important compound semiconductor for solid state devices, and the authors' interests stem from the fact that it shows promise as a material for the detection of nuclear radiation. GRA

N75-25747# Army Foreign Science and Technology Center, Charlottesville, Va.
EFFECT OF DEFORMATION ON THE THERMOELECTRIC PROPERTIES OF Bi2Te3-Bi2Se3
A. Z. Kuliev, A. S. Okhotin, D. A. Asadov, and K. Sh. Kakhramanov 20 May 1974 6 p Transl. into ENGLISH from Teplofizich. Svoistva Tverd. Tel (Baku), 1971 p 30-33
(AD-A008253; FSTC-HT-23-423-74) Avail: NTIS CSCL 20/12

The effect of an external unilateral pressure up to 250 kgf/sq cm on electrical conductivity, thermal emf and thermal conductivity of n-type Bi2Te3 - Bi2Se3 was investigated over the 300-550K temperature range. Electrical conductivity at 300K increases linearly up to 100 kgf/sq cm, then decreases sharply, but this is not observed at higher temperatures. This may be due to a decrease in activation energy of impurities, with electron scattering as a consequence of new defects at higher pressures. The lattice and electron components of thermal conductivity show a similar maximum at 100 kgf/sq cm. Changes in electrical conductivity and thermal emf, as a function of number of stress cycles were measured and they are presented. GRA

N75-25748# Intelcom Rad Tech, San Diego, Calif.
STUDY OF THE EFFECTS OF RADIATION ON THE

ELECTRICAL AND OPTICAL PROPERTIES OF HgCdTe
Charles E. Mallon, Barry A. Green, Roland E. Leadon, and James A. Naber 31 Dec. 1974 52 p refs
(Contract F19628-72-C-0311; AF Proj. 5621)
(AD-A008050; INTEL-RT-8027-012; SR-4; AFCRL-TR-75-0018) Avail: NTIS CSCL 20/12

This report discusses the results of experimental and theoretical investigations of the effects of electron, neutron, and gamma irradiation on the optical and electrical properties of the alloy semiconductor HgCdTe. These effects are of major interest in this program, since this data can be used to predict the radiation response of devices fabricated from HgCdTe. Section 2 discusses experimental methods used in this effort. The results of a 10K neutron irradiation of an n-type sample, QM 48-19, are presented. Changes in lifetime, carrier density, Hall mobility, and conductivity at 80K were studied as a function of electron energy between 2 and 30 MeV. Preirradiation temperature dependence measurements of carrier density, Hall mobility, conductivity, and steady-state photoconductivity of a p-type HgCdTe sample, QM 1, are presented. This sample was irradiated at 80K with 5-MeV electrons, which resulted in type conversion from p-type to n-type. The final section presents mobility and lifetime analysis and correlates the effects observed for neutron, gamma, and electron irradiations. GRA

N75-25749# Ohio State Univ. Research Foundation, Columbus.
TRAP DISTRIBUTION IN SEMICONDUCTORS Final Report, 1 Jul. 1971 - 30 Jun. 1974
W. W. Anderson Nov. 1974 57 p refs
(Contract F33615-71-C-1858; AF Proj. 7885)
(AD-A008181; ARL-74-0142) Avail: NTIS CSCL 20/12

Impurity or defect levels in luminescent semiconductors have been studied to evaluate the usefulness of infrared stimulable phosphors in an infrared imaging device. ZnS phosphors and crystals which are sensitive in the spectral ranges of three is less than lambda is less than five and eight is less than lambda is less than 10 micrometer have been prepared. An expression for the display signal to noise ratio of an IR imaging device based on traditional models of the IR stimulation process has been derived. The theory has been qualitatively checked with an IR telescope. However, contrast enhancement is necessary for a useful device. Equipment has been developed for the rapid evolution of phosphor characteristics pertinent to IR stimulated luminescent imaging from a thermal source. GRA

N75-25750# National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
STANDARD X-RAY DIFFRACTION POWDER PATTERNS: SECTION 12, DATA FOR 57 SUBSTANCES Interim Report
Howard F. McMurdie, Marlene C. Morris, Eloise H. Evans, Camden R. Hubbard, and Simon J. Carmel Feb. 1975 92 p refs
(COM-75-50162/7; NBS-Mono-25-Sect-12) Avail: NTIS MF $2.25; SOD HC as C13.44:25/Sec-12 CSCL 20B

Standard X-ray diffraction patterns are presented for 57 substances. Twenty-five of these patterns represent experimental data and 32 are calculated. The experimental X-ray powder diffraction patterns were obtained with an X-ray diffractometer. All d-values were assigned Miller indices determined by comparison with computed interplanar spacings consistent with space group extinctions. The densities and lattice constants were calculated, and the refractive indices were measured whenever possible. The calculated X-ray powder diffraction patterns were computed from published crystal structure data. Both peak height and integrated intensities are reported for the calculated patterns. GRA

N75-25751# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
[ELECTRON AND SOLID STATE PHYSICS, CONTROL THEORY, ANTENNA ARRAYS, AND PLASMA PHYSICS] Annual Progress Report, 1 Jan. - 31 Dec. 1974
Apr. 1975 93 p refs
(Contracts N00014-67-A-0298-0006; N00014-67-A-0298-0005)
(AD-A008412; APR-88) Avail: NTIS CSCL 20/12

Contents: Very low frequency wave propagation; Electron and solid state physics; Control theory and applications; Electromagnetic phenomena; Coupled antennas and arrays; Antennas and waves in and over dielectric, conducting, and plasma media. GRA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N75-25752# California Univ., Livermore. Lawrence Livermore Lab.
BEHAVIOR OF POROUS BERYLLIUM UNDER THERMOMECHANICAL LOADING: PART 2: QUASI-STATIC DEFORMATION
R. N. Schock, A. E. Abey, and A. G. Duba 16 Oct. 1974 20 p refs
(Contract W-7405-eng-48)
(UCRL-51682-Pt-2) Avail: NTIS HC $3.25

Results of loading and unloading of two types of porous beryllium under conditions of uniaxial strain and hydrostatic pressure indicate that the total volume change before the onset of yielding is small, and that there is a maximum stress-porosity function which describes pore-collapse, independent of loading and unloading cycles. Comparison of the data taken prior to yielding with theoretical models shows the influence of aspherical pores which result in increased compressibility on initial loading. Initial yielding is much more distinct in the sintered than in the unsintered material, and is believed to be an indication of the presence of pores of higher average sphericity produced by the sintering process. Both materials exhibit shear-enhanced compaction when loaded in uniaxial strain. Author (NSA)

N75-25753# National Bureau of Standards, Washington, D.C.
THE THERMODYNAMICS OF THORIUM-OXYGEN AND URANIUM-OXYGEN SYSTEMS Final Report, 14 Jun. 1973 - 30 Jun. 1974
Stanley Abramowitz 19 Feb. 1975 30 p refs
(ARPA Order 1433)
(AD-A008438; DNA-3546F) Avail: NTIS CSCL 07/4

The vapor pressure data for the uranium-oxygen and thorium-oxygen systems have been reviewed. Free energies of formation for the species UO, UO2, ThO, and ThO2 have been chosen. Tables of thermodynamic functions for these species are presented. GRA

N75-25754# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
PROVISIONAL VALUES FOR THE THERMODYNAMIC FUNCTIONS OF ETHANE
Robert D. Goodwin 1 Jun. 1974 343 p refs Sponsored in part by Am Gas Assoc., Arlington, Va.
(COM-75-10130/3; NBSIR-74-398) Avail: NTIS HC $9.50 CSCL 07D

Thermophysical properties are tabulated at uniform temperatures over the entire range of fluid states from 90 to 600 K along isobars to 700 bar. A new, rational equation of state is employed for the first time. Thermodynamic functions in the compressed liquid at T less than T sub c are obtained by use of specific heats C sub p (T) along a high pressure isobar. GRA

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N75-25755*# Georgia Inst. of Tech., Atlanta. Coll. of Engineering.
NASA-GIT PREDOCTORAL DESIGN TRAINING PROGRAM Final Report
Mar. 1974 28 p

(Grant NGT-11-002-064)
(NASA-CR-142905) Avail: NTIS HC $3.75 CSCL 05I

The training program is discussed briefly, and the quantity and quality of academic achievement of those students who were supported by the traineeships are summarized. Dissertations which were completed or on which substantial progress was made are listed, along with a short description of the activities and status of each of the former trainees. M.J.S.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N75-25756*# Syracuse Univ., N.Y.
SYRACUSE/NASA PROGRAM: A HISTORICAL CRITIQUE: MULTIDISCIPLINARY STUDIES IN MANAGEMENT AND DEVELOPMENT PROGRAMS IN THE PUBLIC SECTOR Final Report
Martin E. Barzelay Aug. 1974 39 p refs
(Grant NGL-33-022-090)
(NASA-CR-142863) Avail: NTIS HC $3.75 CSCL 05A

A historical critique is presented of the Syracuse/NASA program on management and development programs. Brief summaries are included of each of the major projects undertaken, including identification of the principal investigators and the university departments and disciplines involved. Author

N75-25757# Army Foreign Science and Technology Center, Charlottesville, Va.
AN ANALYTICAL APPROACH TO MAKING UP PLANS OF THEMES OF SCIENTIFIC RESEARCH INSTITUTES
G. M. Dobrov, T. A. Kukhtenko, and T. I. Shchedrina 15 Jun. 1974 25 p refs Transl. into ENGLISH from Nauk. Inform. Resp. Mezhvedomstvennyi Sb. (USSR), v. 58, no. 7, 1972 p 3-14
(AD-A008344; FSTC-HT-23-0113-74) Avail: NTIS CSCL 05/1

An analytical approach for compiling plans in scientific research institutes shows that the question is important economically. One must take into account various factors before deciding which plans to use for research. Manpower, expenses and other considerations must be evaluated and one must also bear in mind what will be the results of taking a certain decision, and will the ends justify the means. GRA

N75-25758# Office of the Chief of Naval Operations, Washington, D.C.
VISIBILITY AND MANAGEMENT OF SUPPORT COSTS
F. Dale Smith, Thomas King, James W. Prichard, A. Derr, and Kenneth E. Marks 3 Apr. 1975 200 p refs
(AD-A008334) Avail: NTIS CSCL 15/5

The study addresses the means to provide management information concerning the costs of operation and support experienced for aircraft weapon systems. The study concludes that two separate MIS (Management Information Systems) are required to meet detailed requirements stated by the DOD Management by Objectives program. It recommends establishment of one MIS to collect costs at the complete weapon system level for selected cost elements which span the full spectrum of operating and support functions. It also recommends further development of an existing prototype MIS based on 3M data to collect detailed costs of maintenance within the weapon system work breakdown structure. GRA

N75-25759# Bendix Corp., Cocoa Beach, Fla. Launch Support Div.
OSHA SAFETY AND HEALTH TRAINING GUIDELINES FOR GENERAL INDUSTRY, VOLUME 1 Final Report
D. E. Lowry and H. E. Adams Feb. 1975 117 p
(PB-239310/6; DOL-L73-142-1) Avail: NTIS HC $5.25 HC also available from NTIS $11.00/set of 3 reports as PB-239309-SET CSCL 06J

Training guidelines are presented to meet the training requirements contained in the Occupational Safety and Health Standards. Title 29, Code of Federal Regulations, promulgated by the Department of Labor. Occupational Safety and Health Administration. Guidelines are presented in three separate volumes to meet standards for general industry, construction ideals with those standards contained in Part 1910. Occupational Safety and Health Standards for General Industry. GRA

N75-25760# Bendix Corp., Cocoa Beach, Fla. Launch Support Div.
OSHA SAFETY AND HEALTH TRAINING GUIDELINES FOR MARITIME OPERATIONS, VOLUME 2 Final Report
D. E. Lowry and H. E. Adams Feb. 1975 44 p 3 Vol.
(PB-239311/4; DOL-L73-142-2) Avail: NTIS HC $3.75 HC also available from NTIS $11.00/set of 3 reports as PB-239309-SET CSCL 06J

The volume deals with those standards contained in Parts 1915-19. Occupational Safety and Health Standards for Maritime employment. GRA

N75-25761# Bendix Corp., Cocoa Beach, Fla. Launch Support Div.
OSHA SAFETY AND HEALTH TRAINING GUIDELINES FOR CONSTRUCTION, VOLUME 3 Final Report
D. E. Lowry and H. E. Adams Feb. 1975 71 p 3 Vol.
(PB-239312/2; DOL-L73-142-3) Avail: NTIS HC $4.25 HC also available from NTIS $11.00/set of 3 reports as PB-239309-SET CSCL 06J

The volume deals with those standards contained in Part 1926. Occupational Safety and Health Standards for Construction. GRA

N75-25762# Information Systems Center, Cincinnati, Ohio.
MANAGING HUMAN SERVICES: SOME THEORETICAL OBSERVATIONS AND A PRACTICAL MODEL FOR BUDGET DECISION MAKING
R. D. Smalley Aug. 1973 57 p
(Grant SRS-12-55934)
(PB-239814/7; ISC-090473) Avail: NTIS HC $4.25 CSCL 05K

The relationship of basic values to managerial technology in formulating policies for the delivery of social services is discussed. Then considering budgetary decisions, the theoretical framework for a mathematical decision model is explained. GRA

N75-25763# National Planning Association, Washington, D.C.
ASSESSING THE IMPACT OF CHANGES IN NATIONAL PRIORITIES FOR THE UTILIZATION OF SCIENTISTS AND ENGINEERS Final Report
Leonard A. Lecht, Ivars Gutmanis, and Richard J. Rosen Feb. 1974 136 p refs
(Grant NSF GR-32464)
(PB-239752/9) Avail: NTIS HC $5.75 CSCL 05I

Changes in national priorities can have an important bearing on requirements for scientists and engineers. This report represents the findings of a pilot study to assess the potentials for anticipating the scientific manpower requirements likely to be generated by expenditures in five major industries for the abatement of air, water, and solid-waste pollution in the private economy in the next 5 or 10 years. The essential element in the study is the derivations of manpower requirements from the estimated levels of expenditures for plant and equipment, for operations and maintenance, and for research and development related to differences in the priorities assigned to pollution control in the next decade. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N75-25764+ Bibliotheques Nationale, Paris (France). Bureau pour l'Automatisation des Bibliotheques.
ANALYSIS AND PROGRAMMING OF AN AUTOMATED

CATALOG OF SCIENTIFIC AND TECHNICAL LIBRARIES AND DOCUMENTATION CENTERS Final Report [ANALYSE ET PROGRAMMATION D'UN SYSTEME AUTOMATISE DE CATALOGUE COLLECTIF DES BIBLIOTHEQUES ET CENTRES DE DOCUMENTATION DANS LES DOMAINES SCIENTIFIQUES ET TECHNIQUES]
Michel Boisset May 1974 282 p refs In FRENCH
(Contract DGRST-73-7-1170)
Avail: NTIS HC $8.75

The organization of data bases and software, programming of subsystems, information networks and computer systems, national and international bibliographic data acquisition, and online questioning are discussed. A sources file location is projected. Software is laid down in detail. ESRO

N75-25765*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
INFORMATION MANAGEMENT SYSTEM: A SUMMARY DISCUSSION
R. Stuart Sayers 25 Jan. 1972 45 p
(NASA-TM-X-66866; MSC-05800) Avail: NTIS HC$3.75 CSCL 05B

An information management system is proposed for use in the space shuttle sortie, the modular space station, the tracking data relay satellite and associated ground support systems. Several different information management functions, including data acquisition, transfer, storage, processing, control and display are integrated in the system. Author

N75-25766# Cambridge Consultants Ltd. (England).
THE APPLICATION OF ADVANCED DATA MANAGEMENT CONCEPTS TO THE MANIPULATION OF SPACECRAFT DATA Final Report
R. A. Mortimer, D. A. Reeve, and M. H. Ross Nov. 1974 106 p refs
(Contract ESOC-570/73-AR)
(ESRO-CR(P)-614) Avail: NTIS HC $5.25

A data management system for the manipulation of spacecraft data in the European Space Operations Centre of ESRO/ESA is discussed. A practical data retrieval system is presented and the command language and user definition are dealt with. Management of retrievals, including requirements, scheduling, resource allocation, protection, and security, are discussed. The specification and implementation of the data management system are detailed. ESRO

N75-25767# System Development Corp., Santa Monica, Calif.
USER'S GUIDE TO THE SOLAR BIBLIOGRAPHY FILE
Timothy Diller 30 Dec. 1974 29 p refs
(Contract DAHC15-73-C-0080; ARPA Order 2254)
(AD-A008459; SDC-TM-5292/000/02) Avail: NTIS CSCL 05/7

The document contains a general explanation of the bibliographic citation file of SOLAR (a Semantically Oriented Lexical ARchive). It is intended as an introduction and reference manual for the on-line user, the casual reader, or the data collector. The document indicates the design concepts, retrieval procedures, and data collection procedures. A complete list of SOLAR documentation is given in the introduction to this document. This document is a reissue of TM-5292/000/01 (AD/A-004 268) and supersedes that document. GRA

N75-25768# Defense Documentation Center, Alexandria, Va.
DEFENSE DOCUMENTATION CENTER REFERRAL DATA BANK DIRECTORY
Alice L. Cox Apr. 1975 350 p refs
(AD-A008200; DDC-TR-75-3) Avail: NTIS CSCL 05/2

The revised directory of the information sources in the DDC Referral Data Bank (the 5th edition) consists of a compilation of computer printouts, each of which gives for a single activity detailed descriptive information on the mission, scope and services provided. Arrangement is alphabetical, with indexes by director/contact and by subject. A list of Department of Defense Information Analysis Centers is included. GRA

N75-25769# Texas Univ., Austin. Linguistics Research Center.
DEVELOPMENT OF GERMAN-ENGLISH MACHINE TRANSLATION SYSTEM Final Technical Report, 6 Jul. 1973 - 30 Jun. 1974
Winfred P. Lehmann and Rolf A. Stachowitz Feb. 1975 123 p refs
(Contract F30602-74-C-0028)
(AD-A008525; RADC-TR-75-2) Avail: NTIS CSCL 05/7

Work on the completion of a pilot system for mechanical translation of German scientific and technical text into English is described. This report describes the effort performed in the area of grammar, formalism, programming, linguistic description and lexicographic description. This report also describes the results of an experiment performed during the reporting period which was designed to show the system's capability to produce quality mechanical translation. GRA

N75-25770# Information Systems Center, Cincinnati, Ohio.
SERVICES INTEGRATION: SELECTED RESEARCH STUDIES Technical Report, 1966 - Aug. 1973
Robert E. Quinn, R. D. Smalley, E. Jean Brown, Jeanne R. Nordloh, and Douglas E. Warns Aug. 1973 67 p
(Grant SRS-12-55934)
(PB-239818/8; ISC-082773) Avail: NTIS HC $4.25 CSCL 05K

The document, part of a series on the role of information systems in the field of human services, considers the integration of such services, specifically how information systems fit into interorganizational relationships, multiservice centers as instruments for integration, and the attitudes of agency administrators toward such integration. GRA

N75-25771# Information Systems Center, Cincinnati, Ohio.
THE DEVELOPMENT OF A COMPUTER BASED INFORMATION SYSTEM FOR SOCIAL SERVICE AGENCIES
Robert E. Quinn and Donald B. Walker Aug. 1973 107 p
(Grant SRS-11-55934)
(PB-239816/2; ISC-082273) Avail: NTIS HC $5.25 CSCL 05K

The document, part of a series on the role of information systems in the field of human services, is concerned with the development of such a system for social services, researching its historical development and providing recommendations for planners of future systems. Sample input forms and printouts used in that system are included. GRA

N75-25772# Information Systems Center, Cincinnati, Ohio.
COMPUTER INFORMATION SYSTEMS FOR HUMAN SERVICES: AN IMPACT ANALYSIS Report for 1966 - Aug. 1973
Robert E. Quinn and Myron Greenberg Aug. 1973 86 p refs
(Grant SRS-12-55934)
(PB-239815/4; ISC-083173) Avail: NTIS HC $4.75 CSCL 05K

The document is part of a series on the role of information systems in the field of human services, and attempts to analyze the impacts of a computerized information system at the various agency levels (organizational, intergroup, and individual) of this system. It concludes with a look at two crucial problems, confidentiality and the right to privacy, which was detected when the information system was introduced into services delivery. GRA

N75-25773# Information Systems Center, Cincinnati, Ohio.
INFORMATION SYSTEMS HOW TO GUIDES
Steven Bang and John Stevens Aug. 1973 73 p
(Grant SRS-12-55934)
(PB-239817/0; ISC-090873) Avail: NTIS HC $4.25 CSCL 05K

The document, part of a series on the role of information systems in the field of human services, shows how to develop data collection forms, tabulate and use data once it is collected, and utilize systems analysis for resource allocation decisions within the context of social services. GRA

N75-25774# Battelle Columbus Labs., Ohio.
VARIOUS RESEARCH TASKS RELATED TO ENERGY INFORMATION AND DATA ACTIVITIES. TASK 2 NATIONAL ENERGY INDEXING SCHEMES: CHARACTERIZATION

OF PROBLEM Final Report
R. T. Niehoff, W. D. Penniman, and R. L. Little Nov. 1974 63 p refs
(Grant NSF GN-42243)
(PB-240423/4) Avail: NTIS HC $4.25 CSCL 05B

The development of an integrated vocabulary of energy terminology, problems and potential research hypothesis in the area of multiple data base interrogation, and the potential for a fully developed energy vocabulary conversion guide were investigated. Eleven system vocabularies were analyzed and over 24000 entries were selected and fully integrated. Thesaural origins and key semantic and generic relationships were preserved for each term. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N75-25775# Commerce Dept., Washington, D.C.
COMMERCE TODAY, VOLUME 5, NUMBER 10
17 Feb. 1975 44 p
(COM-74-50944/10) Avail: NTIS MF $2.25; SOD HC CSCL 05C

The overall rise in the gross national product price indicator and the improvement of inflation in the fourth quarter are discussed. Other topics discussed include: national business alliance joining NFL players seeking young talent, the U.S. trade rise in 1974 and the oil price increase leading to a deficit, disposal of hazardous wastes, energy management, domestic business, and international commerce. M.J.S.

N75-25776# Commerce Dept., Washington, D.C.
COMMERCE TODAY, VOLUME 5, NUMBER 11
3 Mar. 1975 44 p
(COM-74-50944/11) Avail: NTIS MF $2.25; SOD HC CSCL 05C

Nonbudget federal expenditures are discussed which have a significant impact on the U.S. economy. Other topics discussed include: deepwater ports which could cut import costs and relieve congested U.S. sealanes; international trade; jobs, salary, credit, and legal status of women and international women's year; energy management; and domestic business. M.J.S.

N75-25845 Commissariat a l'Energie Atomique, Saclay (France).
GALACTIC DISTRIBUTION OF GAS, MAGNETIC FIELD AND COSMIC RAYS
J. Paul, M. Casse, and C. J. Cesarsky *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 249-252 refs (For availability see N75-25813 16-93)

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N75-25777# Committee of Conference (U. S. Congress).
NASA AUTHORIZATION OF APPROPRIATIONS FOR FISCAL YEAR 1976 AND TRANSITION PERIOD
Olin E. Teague Washington GPO 4 Jun. 1974 12 p Conference report to accompany H.R. 4700, 94th Congr., 1st Sess., 4 Jun. 1975
(H-Rept-94-259) Avail: US Capitol, House Document Room

Appropriations for research and development, construction of facilities, and research and program management are discussed. Upper atmospheric research programs are defined along with a breakdown of the NASA fiscal year 1976 and transition period budget. M.J.S.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N75-25778*# Old Dominion Univ. Research Foundation, Norfolk, Va. Dept. of Psychology.
STUDY OF PASSENGER SUBJECTIVE RESPONSE TO IDEAL AND REAL-VEHICLE VIBRATION ENVIRONMENTS Final Report, 1 Jun. 1973 - 31 Aug. 1974
Raymond H. Kirby and Peter J. Mikulka Jun. 1975 35 p ref
(Grant NGR-47-003-083)
(NASA-CR-142858) Avail: NTIS HC $3.75 CSCL 13F

The stimulus received by subjects tested on the passenger ride quality apparatus (PRQA) is defined. Additional analyses on the data collected from field tests using buses, were conducted to assess the relation between subjective ratings of ride quality and vibrations measured on the buses, and to better define the vibration stimulus measured in the field. The relation of subjective evaluation of simulations of bus rides produced by the DRQA to subjective evaluations of the actual bus rides is discussed. The relative contribution of the seat and floor vibration to human comfort in a simulated aircraft ride environment is discussed along with the determination of equal comfort curves through magnitude estimation. M.J.S.

N75-25779# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
TRUCK NOISE 3-D: THE ECONOMICS OF QUIETING THE FREIGHTLINER CAB-OVER-ENGINE DIESEL TRUCK
Gene E. Fax and Michael C. Kaye Oct. 1974 112 p refs
Sponsored by DOT Prepared in cooperation with Freightliner Corp., Portland, Oreg.
(PB-240010/9; BBN-2563; DOT-TST-75-22) Avail: NTIS HC $5.25 CSCL 13F

This report presents the results of a study of the costs of quieting a heavy cab-over-engine diesel tractor. The first four sections deal with the effects of possible noise control treatments on the fuel consumption, maintenance requirement, and cargo capacity of a truck engaged in general cargo haulage. The remainder of the report describes the development and use of an optimization technique for determining, for a desired truck noise level, the combination of treatments that has the least adverse cost impact. Cost impact is expressed in terms of a discounted cash flow index. A similar analysis is performed for trucks engaged in bulk haulage and in general cargo haulage operations under the condition of a rise in fuel price from $0.30 to $0.60 per gallon. GRA

N75-25780# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
TRUCK NOISE 3-F: FINAL CONFIGURATION OF FREIGHTLINER QUIETED TRUCK
Michael C. Kaye and Erich K. Bender Oct. 1974 65 p refs
Sponsored by DOT Prepared in cooperation with Freightliner Corp., Portland, Oreg.
(PB-240011/7; DOT-TST-75-23) Avail: NTIS HC $4.25 CSCL 13F

This report provides the rationale for selecting a final set of noise treatments for the freightliner quieted truck, describes the salient features of the treatments, and presents the noise and performance characteristics of that truck prior to its entering a one-year field test. Using the results of noise level vs. cost optimization study and having the objective of field-testing some innovative noise-control techniques. A truck was built with many minor treatments and the following principal features: a partial engine enclosure lined with sound-absorptive material, a manifold muffler, two-stage engine mounts, and a thermostatically controlled fan. GRA

N75-25781# Little (Arthur D.), Inc., Cambridge, Mass.
MANUAL FOR DEICING CHEMICALS: APPLICATION PRACTICES Final Report, Jul. 1972 - Jun. 1974
David L. Richardson, Robert C. Terry, Jane Metzger, and Raymond

J. Carroll Dec. 1974 164 p refs
(Contract EPA-68-03-0154)
(PB-239694/3; EPA-670/2-74-045) Avail: NTIS; SOD HC $6.25 CSCL 13B

The results of a study to minimize the loss to the environment of chemicals used in controlling snow and ice on highways are reported. Practical guidelines are presented for the use of deicing chemicals: (1) supervisory aspects of proper chemical usage are defined, including organization and personnel training; (2) elements of proper decision-making are discussed, including weather forecasting, setting chemical application rates and accounting for chemical usage; and (3) winter road maintenance requirements and major equipment classes are described. Legal requirements for and constraints on snow and ice control are also considered. GRA

88 SPACE SCIENCES (GENERAL)

N75-25782*# Executive Office of the President, Washington, D.C.
AERONAUTICS AND SPACE REPORT OF THE PRESIDENT, 1974 ACTIVITIES
[1975] 145 p
Avail: NTIS MF $2.25; SOD HC $2.10

The U.S. Government activities for 1974 in aeronautics and space are presented. Significant contributions toward the fulfillment of the nation's goals in space and aeronautics are covered, including application of space systems and technology to beneficial uses on earth, exploration of space and increase of scientific knowledge, development of improved space systems and technology, international cooperation, and advancement of civil and military aeronautics. Also in 1974, space activities in the private sector expanded to provide additional services to the public. The accomplishments are summarized. Author

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N75-25783*# Denver Univ., Colo. Dept. of Physics and Astronomy.
RESEARCH STUDY OF BETA CEPHEI VARIABLE STARS USING DATA FROM OAO-2 Final Technical Report, 1 May 1974 - 30 Apr. 1975
Janet Rountree Lesh 30 Apr. 1975 14 p refs
(Grant NsG-5004)
(NASA-CR-142804) Avail: NTIS HC $3.25 CSCL 03A

Photometric data from the Wisconsin Experiment package on OAO-2 were obtained for six Beta Cephei variable stars. The data were reduced in accordance with the OAO 2/Wisconsin Experiment Package Photometer Users Guide. For delta Cet and gamma Peg, there were enough data points to form reliable composite light curves at seven or eight ultraviolet wavelengths. The light curves are well represented by sine waves in phase with the blue light curve for each star. The amplitude of the light variation increases with shorter wavelengths. For theta Oph, epsilon Cen, eta Sco, and Lambda Sco, mean magnitudes and light ranges were obtained at several ultraviolet wavelengths. No significant differences were found between the mean, de-reddened ultraviolet colors of the observed stars, and the mean values for standard stars computed by Bottemiller. An attempt to derive a temperature scale from a comparison of the observed ultraviolet colors with Kurucz models was unsuccessful. Author

N75-25784*# Princeton Univ., N.J. Dept. of Astrophysical Sciences.
DEVELOPMENT AND EVALUATION OF INFRARED SENSITIVE IMAGE SENSORS FOR SPACE ASTRONOMY Final Report
Donald C. Morton 13 May 1975 15 p refs
(Contract NSR-31-001-259)
(NASA-CR-142928) Avail: NTIS HC $3.25 CSCL 03A

The experimental development and evaluation of infrared vidicons for use in solving high precision high flux broadband astronomical problems are discussed. Data cover the EOS, silicon, and doped germanium vidicons. Results are graphed and problems encountered using the vidicons in electrical cameras are reported. E.H.W.

N75-25785*# Chalmers Univ. of Technology, Goteborg (Sweden).
RADIO OBSERVATIONS OF INTERSTELLAR CH, PART 1
O. E. H. Rydbeck, E. Kollberg, A. Hjalmarson, A. Sume, J. Ellder, and W. M. Irvine (Mass. Univ., Amherst) Mar. 1975 303 p refs
(Grant NGL-22-010-023)
(NASA-CR-142977; RR-120) Avail: NTIS HC $9.25 CSCL 03A

Galactic observations of interstellar CH are presented. The observations are made with a traveling wave maser preamplifier, in the Onsala 25.6 telescope. This gives a zenith system noise temperature of about 34 K. Other interstellar gas species (such as CO, H2) are studied also. Theoretical considerations of excitation temperature and optical depth calculations are given. The CH energy level structure of the lowest ratational states is discussed in relation to the excitation of the radical by collisions. It is postulated that the deficiency in very dense molecular clouds is due to the radical being consumed by the formation of the observed, more complex molecules. No good agreement is found between the observations and existing theories of interstellar CH formation, which seem to underestimate the CH abundance. Author

N75-25786# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).
CONTRIBUTIONS TO SOME EXACT GEODETICAL ASTRONOMY METHODS TAKING PARTICULAR ACCOUNT OF THE UNIVERSAL INSTRUMENT THEO 002 Ph.D. Thesis - Tech. Univ. Munich [BEITRAEGE ZU EINIGEN GENAUEN VERFAHREN DER GEODAETISCHEN ASTRONOMIE UNTER BESONDERER BERUECKSICHTIGUNG DES UNIVERSALS THEO 002]
Alfred Bauch Bayerische Akad. der Wiss. 1974 205 p refs In GERMAN Sponsored by Deut. Forschungsgemeinschaft
(Ser-C/Diss-204; TUM-Mitt-117; ISBN-3-7696-9260-8) Avail: NTIS HC $7.25

A general description is given of the astronomical geodetical instrumentation, and special attention is given to the universal Theo 002. An introduction is provided to the discussion of error sources of exact methods, and a description is given of the instrument for better understanding of the formal treatment of the compensator errors. The principles of time, azimuth, and latitude measurements are discussed. ESRO

N75-25787# Naval Observatory, Washington, D.C.
PUBLICATIONS OF THE UNITED STATES NAVAL OBSERVATORY SECOND SERIES. VOLUME 22, PART 6: PHOTOGRAPHIC MEASURES OF DOUBLE STARS
F. J. Josties, C. C. Dahn, V. V. Kallarakal, M. Miranian, and G. G. Douglass 1974 104 p refs
(AD-A008366) Avail: NTIS CSCL 03/1

The series of photographic measures of double stars covers approximately a 5 1/2 year period and is complete through the winter observing season 1972-73. It is a continuation of two earlier series (Franx, et al., 1963; Kallarakal, et al., 1969). Table I lists 2942 measures of Delta alpha (cos delta) and (Delta delta) on 2693 individual plates for 398 double stars. Table II lists the seasonal means for each star. All of the plates in the present series were taken with 26-inch refractor in Washington, D.C. GRA

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N75-25788# Joint Publications Research Service, Arlington, Va.
STAR SENSORS AND THEIR PERFORMANCE IN STABILIZED ASTROPHYSICAL PLATFORMS
G. A. Gurzadyan and M. N. Krmoyan 20 Jun. 1975 5 p refs
Transl. into ENGLISH from Shestov Mezhdunarodnyy Simpozium po Upravleniyu v Prostranstve Mezhdunarodnoy Federatsii po Avtomaticheskomu Upravleniyu (IFAK), 1974 p 92-95 Presented at the 6th Intern. Symp. of the IFAC on Autom. Control in Space, 1974
(JPRS-65051) Avail: NTIS HC $3.25

Star sensors and their performance in stabilized astrophysical platforms are discussed. A comparison is made between one- and two-coordinate star sensors with differing fields of view, precision, dynamic ranges for stars, and time constants. Equations for calculating the sensitivity curves for the photomultiplier and the threshold sensitivity of the sensors are given. The optical systems were tested in the open sky on Orion 2 and on Soyuz 13 and were shown to concur with expected results. L.B.

N75-25789*# California Inst. of Tech., Pasadena.
RESEARCH IN PARTICLES AND FIELDS Semiannual Status Report, 1 Oct. 1974 - 31 Mar. 1975
Rochus E. Vogt 31 Mar. 1975 35 p refs
(Grant NGR-05-002-160)
(NASA-CR-142956) Avail: NTIS HC $3.75 CSCL 03B

Cosmic ray research and particle and field theory in space are examined. Data also cover experiments designed especially for spacecraft. An extensive bibliography is included. E.H.W.

N75-25790*# Dudley Observatory, Albany, N.Y.
CORONAGRAPH PARTICULATE MEASUREMENTS. SKYLAB FLIGHT EXPERIMENT T025 Final Report
J. Mayo Greenberg, Donald W. Schuerman, Frank Giovane, Ru-Tsang Wang, and David C. Hardy 31 Mar. 1975 206 p refs
(Contract NAS9-12539)
(NASA-CR-141855) Avail: NTIS HC $7.25 CSCL 03B

Major results of the Skylab T025 Coronagraph experiment designed to monitor the particulate contamination about the spacecraft and to study the earth's atmospheric aerosol distribution are presented. A model for comet outbursts based on the properties of amorphous ice and ground based narrow-band and white light photography of comet Kohoutek ten days to perihelion are included. The effect of atmospheric refraction on the analysis of the T025 atmospheric data was also investigated. Author

N75-25791# California Univ., Livermore. Lawrence Livermore Lab.
NUMERICAL STUDIES OF MASS TRANSFER AND ACCRETION IN X-RAY BINARY SYSTEMS Ph.D. Thesis
M. L. Alme 25 Sep. 1974 200 p refs
(Contract W-7405-eng-48)
(UCRL-51664) Avail: NTIS HC $7.00

Several aspects of mass transfer and accretion in X-ray binary systems were numerically investigated. Computer calculations were performed of (1) the X-ray emission resulting from the accretion of material onto a neutron star, (2) the X-ray heating of the surface of HZ Her, and (3) the X-ray heating of a gas stream leaving HZ Her through the inner Lagrangian point, falling toward Her X-1. In the accretion calculations it was found that for high mass neutron stars, the emitted spectra differ only slightly from blackbody, particularly at lower luminosities. For intermediate mass neutron stars the spectra differ substantially from blackbody spectra, especially at higher luminosities. The calculated spectra differ greatly from blackbody spectra at all luminosities for low mass neutron stars. The attenuation and diffusion of a beam of X-rays incident on the surface of HZ Her were calculated. Atmospheric hydrogen was assumed to be in LTE. All other elements were treated non-LTE. Author (NSA)

N75-25792# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 365. PART 1. (PROMPT REPORTS). DATA FOR DECEMBER 1974 - NOVEMBER 1974
Hope I. Leighton Jan. 1975 115 p
(COM-75-50193-365-1; SGD-365-Pt-1) Avail: NTIS MF $2.25; National Climatic Center, Federal Bldg., Asheville, N.C., Attn: Publications HC $1.40 CSCL 03B

Prompt reports are given on data for December 1974 and November 1974. These deal with alert periods, daily solar indices, solar flares, solar radio waves, spacecraft observations, solar X-ray radiation, solar proton monitoring, inferred IP magnetic field polarities, daily solar activity centers, sudden ionospheric disturbances, cosmic rays, geomagnetic indices, and radio propagation indices. GRA

N75-25793# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 365, JANUARY 1975. PART 2: (COMPREHENSIVE REPORTS). DATA FOR JULY 1974 - JUNE 1974 AND MISCELLANEA
Hope I. Leighton Jan. 1975 111 p
(COM-75-50193-365-2; SGD-365-Pt-2; NOAA-75021814) Avail: NTIS MF $2.25; National Climate Center, Federal Bldg., Asheville, N.C., Attn: Publications HC $1.40 CSCL 03B

Comprehensive reports are given on data for July 1974 and June 1974. These deal with solar flares, solar radio waves, magnetograms of geomagnetic storms, abbreviated calendar record, regional flare index, solar X-ray radiation, and solar radio waves. GRA

N75-25794# Ruhr Univ., Bochum (West Germany). Bereich Extraterrestrische Physik.
BASIC MODELS FOR INTERPRETATION OF ZODIACAL LIGHT MEASUREMENTS AND LIGHT SCATTERING BY DUST PARTICLES OF DIFFERENT SHAPES Final Report [GRUNDLAGENUNTERSUCHUNGEN ZUR INTERPRETATION EXTRATERRESTRISCHER ZODIAKALLICHTMESSUNGEN UND LICHTSTREUUNG VON STAUBPARTIKELN VERSCHIEDENER FORMEN]
Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1974 79 p refs In GERMAN; ENGLISH summary
(Contract WRK-228)
(BMFT-FB-W-74-10) Avail: NTIS HC $4.75; ZLDI, Munich DM 16.60

Zodiacal light measurements are interpreted by means of the three-dimensional distribution of interplanetary dust and light scattering by small particles; a computer program for light scattering functions of spherical mantle core particles; and scattering functions derived from microwave analog measurements of finite cylinders, and convex and concave bodies. For individual titles, see N75-25795 through N75-25797.

N75-25795 Ruhr Univ., Bochum (West Germany).
MODELS FOR THE INTERPRETATION OF ZODIACAL LIGHT MEASUREMENTS [MODELLE ZUR INTERPRETATION VON ZODIAKALLICHTMESSUNGEN]
Richard Heinrich Giese *In its* Basic Models for Interpretation of Zodiacal Light Meas. and Light Scattering by Dust Particles of Different Shapes Dec. 1974 p 7-31 In GERMAN (For availability see N75-25794 16-90)

The three-dimensional distribution of interplanetary dust and light scattering by small particles was investigated. The dependence of intensity, polarization, and color of zodiacal light on the parameters of model computations is reported. Simple models of the three-dimensional distribution are discussed with respect to observational criteria, useful for interpretation of photopolarimetric measurements of zodiacal light from space probes within and without the ecliptic plane. ESRO

N75-25796 Ruhr Univ., Bochum (West Germany).
LIGHT SCATTERING BY SPHERICAL MANTLE-CORE PARTICLES [LICHTSTREUUNG AN KUGELFOERMIGEN MANTEL-KERN-TEILCHEN]
Gerhard Schwehm *In its* Basic Models for Interpretation of Zodiacal Light Meas. and Light Scattering by Dust Particles of Different Shapes Dec. 1974 p 32-58 In GERMAN (For availability see N75-25794 16-90)

Related to zodiacal dust particle observations, a computer program for light scattering functions of spherical mantle core particles (dielectric and absorbing) was developed and is used to discuss scattering by single particles as well as by polydisperse mixtures of mantle core particles. Results are presented graphically. ESRO

N75-25797 Ruhr Univ., Bochum (West Germany).
SCATTERING BY NONSPHERICAL PARTICLES [STREUUNG NICHT-KUGELFOERMIGER PARTIKEL]
Reiner Zerull *In its* Basic Models for Interpretation of Zodiacal Light Meas. and Light Scattering by Dust Particles of Different Shapes Dec. 1974 p 59-76 In GERMAN (For availability see N75-25794 16-90)

In view of the interpretation of space probe zodiacal light measurements, scattering experiments were performed with nonspherical bodies in order to determine the scattering functions. The experiments were carried out in a microwave scattering facility so that the bodies could assume manageable sizes. The bodies examined were finite cylinders (circular, hexagonal, and quadratic cross sections) and concave and convex irregular bodies of dielectric materials. Results are presented graphically. ESRO

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N75-25798*# California Inst. of Tech., Pasadena. Seismological Lab.
PLANETARY SEISMOLOGICAL STUDIES Final Report
19 Jun. 1975 39 p refs
(Grant NGR-05-002-316)
(NASA-CR-142929) Avail: NTIS HC $3.75 CSCL 03B

Seismic experiments on future Mars exploration missions, and the instrumentation required for their performances are reported. Advances in microcomputer techniques of which have made feasible the processing of data prior to transmission to earth are discussed along with experience with the Viking hardware and software as related to future experiments. Sensor techniques are briefly mentioned. Author

N75-25799*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A SURVEY OF LONG TERM INTERPLANETARY MAGNETIC FIELD VARIATIONS
Joseph H. King May 1975 32 p refs Submitted for publication
(NASA-TM-X-70902; X-601-75-136) Avail: NTIS HC $3.75 CSCL 03B

Interplanetary magnetic field data from 10 IMP, AIMP, and HEOS spacecraft were merged into a composite data set spanning 1963 to 1974. A consideration of the mutual consistency of the individual data sets reveals agreement typically to within 0.2 gamma. Composite data set analysis reveals: (1) whereas the yearly averaged magnitudes of all field vectors show virtually no solar cycle variation, the yearly averaged magnitudes of positive- and negative-polarity field vectors show separate solar cycle variations, consistent with variations in the average azimuthal angles of positive- and negative-polarity field vectors, (2) there is no heliolatitude dependence of long time average field magnitudes, (3) field vectors parallel to the earth-sun line are on the average 1 gamma less in magnitude than field vectors perpendicular to this line, and (4) the heliolatitude-dependent dominant polarity effect exhibits a complex sign reversal in the 1968 to 1971 period and a measure of symmetry in 1972 to 1974 not found in earlier data. Author

N75-25800# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
ENERGETIC ELECTRONS IN THE JOVIAN MAGNETOSPHERE Progress Report
D. N. Baker and J. A. VanAllen Mar. 1975 71 p refs
(Contract N00014-68-A-0196-0009)
(AD-A008572; U-of-Iowa-75-13) Avail: NTIS CSCL 03/2

Detailed analysis of Pioneer 10 data shows that the observed counting rates within the magnetosphere of Jupiter were caused primarily by electrons. This identification holds for the magnetodisc region as well as for the central magnetosphere. Absolute omnidirectional intensities of electrons in the magnetodisc are presented for five integral energy ranges: E sub e greater than 0.06, greater than 0.55, greater than 5, greater than 21, and greater than 31 MeV. A model electron differential energy spectrum is found to fit the observed intensities throughout most of the encounter trajectory. It is suggested that the observed spectral shape may be interpreted as resulting from losses of high energy electrons by pitch angle scattering. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N75-25801*# Scientific Translation Service, Santa Barbara, Calif.
THE GUIDING CENTER IN A CELL METHOD IN THE THREE-DIMENSIONAL PROBLEM ON THE INTERACTION OF THE SOLAR WIND PLASMA WITH THE CONDUCTING MODEL OF THE MOON (NUMERICAL EXPERIMENT)
A. S. Lipatov Washington NASA Jun. 1975 34 p refs
Transl. into ENGLISH of the book "Vedushchiy tsentr v yacheyka v trekhmernoy nestatisonarnoy zadache o vzaymodeystvii plazmy solnechnovo vetra c provodyashchey modelyu luny (chislennyy eksperiment)" Report Pr-196, Moscow, Acad. of Sci. USSR, Inst. of Space Res., 1974 p 1-39
(Contract NASw-2483)
(NASA-TT-F-16414) Avail: NTIS HC $3.75 CSCL 03B

A numerical method for simulating a strongly magnetized plasma was proposed. The method is based on a synthesis of the 'particles in a cell' method and the 'guiding center' theory. The problem of the interaction of a nonsteady-state flux of plasma with the conducting model of the moon is solved numerically. Results are presented for the calculations of the formation of the plasma wake of the moon and the interaction with the moon with weak discontinuities of the solar wind. Author

N75-25802# Osservatorio Astronomico, Rome (Italy).
SOLAR PHENOMENA Monthly Bulletin, Apr. 1974
Massimo Cimino Apr. 1974 9 p
(Publ-192) Avail: NTIS HC $3.25

Solar data for April 1974 are presented. Tables include: daily total areas of sunspot groups; heliographic position, classification and area of sunspot groups; longitudinal sunspot magnetic fields; and hours of K-line cinematographic patrol. ESRO

N75-25803# Osservatorio Astronomico, Rome (Italy).
SOLAR PHENOMENA Monthly Bulletin, May 1974
Massimo Cimino May 1974 10 p
(Publ-193) Avail: NTIS HC $3.25

Solar data for May 1974 are presented. Tables include: daily total areas of sunspot groups; heliographic position, classification and area of sunspot groups; longitudinal sunspot magnetic fields, and hours of K-line cinematographic patrol. ESRO

N75-25804# Osservatorio Astronomico, Rome (Italy).
SOLAR PHENOMENA Monthly Bulletin, Nov. 1974
Massimo Cimino Nov. 1974 9 p
(Publ-199) Avail: NTIS HC $3.25

Solar data for November 1974 are presented. Tables include: daily total areas of sunspot groups; heliographic position, classification and area of sunspot groups; longitudinal sunspot magnetic fields, and hours of K-line cinematographic patrol, SCNA and SEA. ESRO

N75-25805# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
THE LATE JUNE 1972 CINOF FLARES Environmental Research Papers
David M. Rust and J. Rene Roy 22 Apr. 1974 40 p refs
(AF Proj. 7649)
(AD-A008481; AFCRL-TR-74-0201; AFCRL-ERP-474) Avail:

NTIS CSCL 03/2

This report is the result of an analysis of observations obtained during the campaign for integrated observations of solar flares. The aim was to obtain a more complete set of optical, radio, X-ray, EUV, and particle observations of a normal solar flare than has been available from earlier, uncoordinated efforts. Flares observed in the McMath regions are discussed, with emphasis on optical and X-ray observations. GRA

N75-25806# Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
OBSERVATIONAL STUDIES OF THE SOLAR GENERAL CIRCULATION Final Report, 1 Jan. 1972 - 31 Dec. 1974
Victor P. Starr Jan. 1975 164 p refs
(Contract F19628-72-C-0002; AF Proj. 8608)
(AD-A008373; AFCRL-TR-75-0057) Avail: NTIS CSCL 03/2

The report investigates aspects of the solar general circulation; namely, the role played by non-symmetric components of motion. Topic areas covered include: Computation and analysis of flow patterns in the solar photosphere; and, Transport of angular momentum toward the equator by solar supergranulation. GRA

N75-25807# Aerospace Corp., El Segundo, Calif. Lab. Operations.
THE RATIO OF IMPULSIVE TO THERMAL X-RAY FLUX AS A FUNCTION OF SOLAR FLARE POSITION Interim Report
David L. McKenzie 1 Apr. 1975 9 p refs
(Contract F04701-74-C-0075)
(AD-A008512; TR-0075(9260-02)-6; SAMSO-TR-75-96) Avail: NTIS CSCL 03/2

A study of 119 flares observed by OSO-7 shows no evident correlation between the ratio of the maximum 20 keV impulsive flux to the maximum 5 keV thermal flux and the flare location. GRA

N75-25808# Chulalongkorn Univ., Bangkok (Thailand). Dept. of Physics.
FINE STRUCTURE OF THE SOLAR CHROMOSPHERE Interim Report, 1 Oct. 1973 - 30 Sep. 1974
Rawi Bhavilai 17 Mar. 1975 14 p refs
(Grant DA-RDRF-S92-554-73-G201; DA Proj. 2M0-61102-B-52B; DA Proj. 2M0-61102-B-53B)
(AD-A008454; ARDG(FE)-344-5) Avail: NTIS CSCL 03/2

The sun was observed in the H-alpha line and around it in the quiet regions and in the active regions. Preliminary results were obtained concerning the life-times and changes of the fine structures in the quiet regions and the active regions, the bright streaks and the identification of the H-alpha plages and the photospheris faculae. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics.*

N75-25809*# California Inst. of Tech., Pasadena.
OBSERVATIONS OF NITROGEN AND OXYGEN ISOTOPES IN THE LOW ENERGY COSMIC RAYS Ph.D. Thesis
Solomon Benjamin Vidor 1975 163 p refs
(Contract NAS5-11066)
(NASA-CR-142961; SRL-75-1) Avail: NTIS HC $6.25 CSCL 03B

The isotopic composition of low-energy nitrogen and oxygen cosmic rays was measured with an electron/isotope spectrometer aboard the IMP-7 satellite to determine the possible source of the particles. Instrument calibration showed the standard range-energy tables to be inadequate to calculate the isotope response, and corrections were obtained. The low-energy nitrogen and oxygen cosmic rays were found to be primarily 14N and 16O. Upper limits were obtained for the abundances of the other stable nitrogen and oxygen isotopes. The nitrogen composition differs from higher energy measurements which indicate that 15N, which is thought to be secondary, is the dominant isotope. Author

N75-25810*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A NONLINEAR THEORY OF COSMIC RAY PITCH ANGLE DIFFUSION IN HOMOGENEOUS MAGNETOSTATIC TURBULENCE
Melvyn L. Goldstein Apr. 1975 54 p refs Submitted for publication
(NASA-TM-X-70903; X-692-75-64) Avail: NTIS HC $4.25 CSCL 03B

A plasma strong turbulence, weak coupling, theory is applied to the problem of cosmic ray pitch angle scattering in magnetostatic turbulence. The theory used is a rigorous generalization of Weinstock's resonance-broadening theory and contains no ad hoc approximations. A detailed calculation is presented for a model of slab turbulence with an exponential correlation function. The results agree well with numerical simulations. The rigidity dependence of the pitch angle scattering coefficient differs from that found by previous researchers. The differences result from an inadequate treatment of particle trajectories near 90 deg pitch angle in earlier work. Author

N75-25811*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FIELD-ALIGNED ELECTRIC CURRENTS AND THEIR MEASUREMENT BY THE INCOHERENT BACKSCATTER TECHNIQUE
Pierre Bauer (CEPHAG/Domaine Univ.), Keith D. Cole, and G. Lejeume May 1975 22 p refs Submitted for publication
(NASA-TM-X-70909; X-621-75-126) Avail: NTIS HC $3.25 CSCL 03B

Field aligned electric currents flow in the magnetosphere in many situations of fundamental geophysical interest. It is shown here that the incoherent backscatter technique can be used to measure these currents when the plasma line can be observed. The technique provides a ground based means of measuring these currents which complements the rocket and satellite ones. Author

N75-25812*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MEASUREMENT OF THE FLUXES OF GALACTIC COSMIC RAY H-2 AND He-3 IN 1972 - 1973
B. J. Teegarden, T. T. VonRosenvinge, F. B. McDonald, J. H. Trainor, and W. R. Webber (New Hampshire Univ.) Apr. 1975 22 p refs Submitted for publication
(NASA-TM-X-70901; X-661-75-100) Avail: NTIS HC $3.25 CSCL 03B

If a nearby source of low-energy helium is present, which has traversed a relatively small amount of matter and thus has not caused the production of a significant amount of H-2 or He-3, then these abundance ratios will be suppressed, particularly at low energies. This seems to be the most likely explanation for low ratios. Author

N75-25813# European Space Research Organization, Paris (France).
THE CONTEXT AND STATUS OF GAMMA RAY ASTRONOMY
Brian G. Taylor, ed. Nov. 1974 393 p refs Presented at 9th ESLAB Symp., Frascati, Italy, 10-12 Jun. 1974
(ESRO-SP-106) Avail: NTIS HC $10.25

Selected papers are presented on cosmic gamma ray burst observations and detectors, diffuse gamma ray background, low energy gamma ray astronomy, galactic emission, and discrete gamma ray sources, as well as on the mission of the ESRO COS B satellite for gamma ray astronomy. For individual titles, see N75-25814 through N75-25859.

N75-25814 Los Alamos Scientific Lab., N.Mex.
COSMIC GAMMA RAY BURSTS: A REVIEW OF THE OBSERVATIONAL DATA
I. B. Strong *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 1-10 refs Sponsored by ERDA (For availability see N75-25813 16-93)

Temporal properties of cosmic gamma ray bursts are discussed, including duration, fluctuation, and frequencies. Energy fluxes and spectral properties are described. Directional data were used to provide estimates of the distance to the sources and the absolute luminosities involved, and it is found that the sources are distributed randomly over the sky. There is evidence to support a galactic origin; the sources lie in the local spiral of the galaxy at the distances of several hundred parsecs and have absolute luminosities equivalent to 10 to the 39th power per event. The known frequencies rule out normal novae and supernovae as the source. ESRO

N75-25815* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A COSMIC GAMMA RAY BURST MEASURED BY APOLLO 16

J. L. Matteson (Calif. Univ., San Diego), J. R. Arnold (Calif. Univ., San Diego), A. E. Metzger (JPL), R. H. Parker (JPL), D. A. Gilman (Cornell Univ.), J. I. Trombka, and L. E. Peterson (Tata Inst. of Fundamental Res.) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 11-16 refs Sponsored in part by Guggenheim Found. (For availability see N75-25813 16-93)
(Contracts NAS7-100; NAS9-10670; Grant NGR-05-005-003)
CSCL 03B

A cosmic gamma ray burst at about 1058:21 UT on April 27, 1972, was detected with an omnidirectional scintillation counter on Apollo 16. The event whose energy was approximately 0.0002 erg/sq cm, was pulse height analyzed in 512 channels over the 0.067 less than or equal to E less than or equal to 5 MeV range, and shows a complex, multipeak structure on a 300 msec time scale. The burst was also measured by a collimated X-ray detector on Apollo 16, giving spectral data in the 2 to 8 keV range which, together with a simultaneous observation by Vela 6A, allows a directional determination. Author (ESRO)

N75-25816 Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.

RECENT MEASUREMENTS WITH A SATELLITE-BORNE COOLED GERMANIUM SPECTROMETER. PART 1: OBSERVATIONS OF THE 18 DECEMBER 1972 GAMMA RAY BURST

G. H. Nakano, W. L. Imhof, and J. B. Reagan *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 17-24 refs Sponsored in part by ONR and Defense Advan. Res. Proj. Agency (For availability see N75-25813 16-93)

Fast time resolution measurements were made on the gamma ray intensity fluctuations and energy spectra during the early phase of the 18 December 1972 gamma burst, which was initially identified by the Vela satellite system. These observations were performed with the first cooled germanium spectrometer flown in space on-board the low-altitude polar orbiting satellite, 1972-076B. Counting rates in the energy range 50 keV to 3 MeV were observed to increase above background by more than an order of magnitude in a series of pronounced and narrow microbursts which occurred as precursors to the Vela trigger. The microbursts have rise and fall times of about 30 msec with pulse widths typically of about 60 msec which indicate the extent of the microburst source region to be less than approximately 1.8 x 10 to the 9th power cm. The photon spectrum is harder in the more intense microburst, being suggestive of a blackbody spectrum, and softens at later times after the Vela trigger. Author (ESRO)

N75-25817 Naval Research Lab., Washington, D.C.

GAMMA-RAY BURSTS OBSERVED FROM OSO-6

G. H. Share, J. F. Meekins, and R. W. Kreplin *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 25-29 refs (For availability see N75-25813 16-93)

Four cosmic gamma ray bursts observed above 30 keV by the X-ray spectrometer onboard OSO-6 in the period August, 1969 to January, 1972 are analyzed. The time histories and energy loss spectra of these events are presented, and data concerning the possible locations of nine of the bursts detected by the Vela satellites in this time period are discussed. The unique source location determined for the event of February 1971 from the Vela and Uhuru observations is questioned. Author (ESRO)

N75-25818* California Univ., Riverside. Dept. of Physics.

A BURST OF ENERGETIC GAMMA RAYS

R. Koga, G. Simnett, and R. S. White *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 31-36 refs (For availability see N75-25813 16-93)
(Grant NGR-05-008-022; Contract N00014-79-A-0200-5004)
CSCL 03B

A burst of gamma rays with energies greater than 1 MeV occurring on May 14, 1972, at 201247 UT (151247 local time) was detected during a balloon flight from Palestine, Texas, at a float altitude of 4g/sq cm residual atmosphere. The detector was a tank of liquid scintillator 1m x 0.5 m x 15 cm surrounded by a 0.6 cm plastic scintillator in anticoincidence. The signal was 60 standard deviations above a steady background of 600 counts/sec. The flux was 0.12 (+0.07 or -0.04) gamma/sq cm, and the time integrated flux 20(+11 or -7) gamma/sq cm. Only one such event was seen during the 8 hours of observation in the daytime on May 14 and 15. Two sub-flares in H alpha occurred during the burst, but not coincident with the start time. A detector on the Solrad satellite observed X-rays on all channels 2 minutes after the gamma ray start time. This event is similar to three earlier reported events. Author (ESRO)

N75-25819* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

PROGRESS IN GAMMA RAY BURST ASTRONOMY

T. L. Cline and U. D. Desai *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 37-45 refs (For availability see N75-25813 16-93)
CSCL 03B

Spectral observations on nine of the eleven known cosmic gamma ray bursts detected from IMP-7 from late 1972 through 1973 are reported. All nine events were found to have average spectra ranging from 100 to 1100 keV. The hypothesis of a single greater than 100 keV average event spectrum for all gamma ray bursts (inferred from IMP-6 observations) was investigated. In addition to the mutual consistency of these 14 IMP events, all independently reported average event spectra fit the IMP-7 common spectrum. This observed lack of variability of the average event spectrum suggests that the production mechanism is tied to more rigidly fixed source parameters than most celestial or solar hard X-ray phenomena. Other characteristics of gamma ray bursts events, are discussed: a high-energy spectral tail with power-law index -2.5, a rising size spectrum from the earlier event rate, and a hint of clustering of event occurrence in time. Author (ESRO)

N75-25820 Consiglio Nazionale delle Ricerche, Frascati (Italy). Lab. di Astrofisica Spaziale.

GAMMA RAY BURSTS: AN OUTLINE OF CURRENT THEORIES

F. Pacini *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 47-50 refs (For availability see N75-25813 16-93)

Various theories are outlined for explaining the origin of gamma ray bursts of high-energy photons with high-energy fluxes from 0.0001 to 0.00001 erg/sq cm, a typical duration of the order of seconds, and spectral range from several keV to about 1 MeV. The isotropy of the sources implies either a local (within 100 pc) or extragalactic (1 to 10 Mpc) origin for the bursts. A discussion of the relation 'number of sources vs. intensity' provides preliminary evidence for a local origin, but the statistics do not yield a conclusive answer. Local and extragalactic models are reviewed and suggest the possibilities of several transient phenomena. Author (ESRO)

N75-25821 Harvard Coll. Observatory, Cambridge, Mass. Center for Astrophysics.

X-RAY CAMERA FOR THE DETECTION AND LOCALIZATION OF GAMMA RAY BURSTS c35

H.F. Helmken, P. Gorenstein, and H. Gursky *In ESRO* the Context and Status of Gamma Ray Astronomy Nov. 1974 p 51-55 refs Prepared jointly with Smithsonian Astrophys. Obs. (For availability see N75-25813 16-93)

A detector is described which uses a random-pinhole collimator in conjunction with a two-dimensional X-ray proportional counter. Performances of one and two-dimensional systems were studied by computer simulation, and imaging proportional counters were assembled. The first, using a single low-resistance wire laced back and forth across the chamber, is in operation in the rocket program and produces images with 1 mm resolution. The second type, which uses carbon-coated quartz wire, may have a higher resolution capability, and was studied for incorporation into a durable large-area detector. The multiple pinhole camera offers an ultimate capability of 1 sec angular resolution with sensitivity several orders of magnitude better than the present actual systems. ESRO

N75-25822 Consiglio Nazionale delle Ricerche, Milan (Italy).
THE CAPABILITY OF COS-B TO MEASURE COSMIC GAMMA RAY BURSTS
G. Boella, M. Gorisse, J. Paul, B. G. Taylor, and R. D. Wills *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 57-62 refs Prepared jointly with Milan Univ., CEA, Saclay, France and ESRTC (For availability see N75-25813 16-93)

The COS-B gamma ray burst detection system included a dome shaped, 11 sq m x 12 mm thick plastic scintillator viewed by nine photomultipliers for the rejection of charged particles; it is referred to as the anticoincidence counter. Its operational characteristics, as well as the gamma burst detection electronics, are presented. The gamma burst data-handling electronics designed to cope with the wide range of temporal behavior observed in gamma ray bursts compatible with the constraints of the limited buffer capacity is described. It is shown that COS-B will be sensitive to gamma ray bursts down to a few % of typical bursts previously observed. Burst onset times can be determined to approximately 1 msec and, with the data-handling system, a wide variety of burst profiles can be studied with a time resolution of 1.6 ms and good statistical accuracy. ESRO

N75-25823 Birmingham Univ. (England). Dept. of Space Research.
A DETECTOR FOR GAMMA RAY BURSTS c35
D. H. Brabban, G. M. Simnett, A. J. Dean (Southampton Univ.), and D. Ramsden (Southampton Univ.) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 63-68 refs (For availability see N75-25813 16-93)

A balloon-borne detector designed to study gamma ray bursts in the broad energy band from 25 keV to 10 MeV is described. The active elements will be flown on a high-altitude balloon from Sioux City, South Dakota, or Palestine, Texas, in 1975, and on a long duration transatlantic balloon flight initiating from Sicily in 1976. The active elements of the detector are arrays of plastic scintillator and collimated NaI (Tl) crystals. The measurements will include time structure of the bursts with a resolution of 100 msec at the onset, decreasing by discrete logarithmic intervals to 6.4 msec after 6.5 sec, 'arrival direction', and evolution of the energy spectrum (25 keV to 25 MeV) of the bursts. During quiet times, the diffuse gamma ray background will be studied. ESRO

N75-25824 Los Alamos Scientific Lab., N.Mex.
FUTURE SATELLITE EXPERIMENTS FOR GAMMA-BURST OBSERVATIONS
W. D. Evans *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 69-76 ref Sponsored by ERDA (For availability see N75-25813 16-93)

Certain objectives for future satellite experiments are identified and methods for achieving these objectives and the requirements they impose on instrument design and program co-ordination are described. Some of the experiments planned for launch during the next few years are discussed, and the extent to which they will satisfy the objectives is considered. It is concluded that the combination of Vela, IMP-7, COS-B, and SolRad Hi will maintain a capability for gamma ray burst observation for another three years. Major improvements concerning spectral distribution, time variations, and precise source location will be available from the 1978 to 1980 time period. Three satellites, Venus Orbiter, Heliocentric, and Mother, equipped with properly designed gamma-burst detectors, will locate the positions of intense sources with an accuracy of few arcs second. Author (ESRO)

N75-25825* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SAS-2 OBSERVATIONS OF CELESTIAL DIFFUSE GAMMA RADIATION ABOVE 30 MeV
D. J. Thompson, C. E. Fichtel, D. A. Kniffen, and R. C. Hartman *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 83-88 refs (For availability see N75-25813 16-93)
CSCL 03B

The small astronomy satellite, SAS-2, used a 32-deck magnetic core digitized spark chamber to study gamma rays with energies above 30 MeV. Data for four regions of the sky away from the galactic plane were analyzed. These regions show a finite, diffuse flux of gamma rays with a steep energy spectrum, and the flux is uniform over all the regions. Represented by a power law, the differential energy spectrum shows an index of 2.5 + or - 0.4. The steep SAS-2 spectrum and the lower energy data are reasonably consistent with a neutral pion gamma-ray spectrum which was red-shifted (such as that proposed by some cosmological theories). It is concluded that the diffuse celestial gamma ray spectrum observed presents the possibility of cosmological studies and possible evidence for a residual cosmic ray density, and supports the galactic superclusters of matter and antimatter remaining from baryon-symmetric big bang. Author (ESRO)

N75-25826 Max-Planck-Institut fuer Extraterrestrische Physik, Munich (West Germany).
OBSERVATIONS OF DIFFUSE COSMIC GAMMA RADIATION BETWEEN 1.5 AND 10 MeV WITH A BALLOON-BORNE DOUBLE COMPTON TELESCOPE
V. Schoenfelder and G. Lichti *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 89-97 refs (For availability see N75-25813 16-93)

Results on the diffuse gamma ray flux between 1.5 and 10 Mev from a balloon-borne double Compton telescope are presented. The cosmic gamma ray flux is determined from the flattening of the growth curve near the top of the atmosphere. Corrections have to be made for inelastic neutron-carbon interactions in the scintillator which cause part of the flattening. The gamma counting rate from regions of the sky with galactic latitudes between b (II) = 0 deg, and b (II) = - 30 degrees is constant within statistics. From this constancy, an extragalactic origin can be deduced for more than 77% of the measured diffuse flux. Author (ESRO)

N75-25827 Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
RECENT MEASUREMENTS WITH A SATELLITE-BORNE COOLED GERMANIUM SPECTROMETER. PART 2: OBSERVATIONS OF SOME GAMMA RAY BACKGROUNDS
G. H. Nakano, W. L. Imhof, and J. B. Reagan *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 99-105 refs Sponsored in part by ONR and Defense Advan. Res. Proj. Agency (For availability see N75-25813 16-93)

High-resolution gamma ray measurements made by a cryogenically-cooled germanium spectrometer onboard a spin-stabilized, polar-orbiting satellite (1972-076B) launched on October 2, 1972, are reported. Gamma ray pulses with energies ranging from 50 keV to 3 MeV were analyzed using a 4096-channel pulse-height analyzer with fast time resolution. The spectrometer performed initially with an overall energy resolution of equivalent 3.5 keV, and remained operative for over 7 months, but with broader resolution. Some recent results are presented on the diffuse cosmic background below 200 keV, on the 0.511 MeV annihilation radiation from the atmosphere, and on the bremsstrahlung produced in the atmosphere by precipitating energetic electrons at high latitudes. Author (ESRO)

N75-25828* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MEASUREMENTS OF THE 0.1-27 MeV COSMIC GAMMA RAY SPECTRUM BY APOLLOS 15 AND 16
L. E. Peterson (Tata Inst. of Fundamental Res.), J. I. Trombka, C. S. Dyer, and J. L. Matteson (Calif. Univ., San Diego) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 107-116 refs Sponsored in part by Guggenheim Found. (For availability see N75-25813 16-93)
(Contracts NAS7-100; NAS9-10670; Grant NGR-05-005-003)
CSCL 03B

The spectrum of diffuse cosmic gamma rays over the 0.127 MeV range was measured by a 7 x 7 cm omnidirectional NaI counter on Apollo 15 and 16. Location of the spectrometer on a 7.6 m extensible boom, use of precision pulse-height analysis, and operation in several modes permitted data to be obtained from which spacecraft and other background contributions could be separated. Recent measurements verified the Apollo spectrum. Author (ESRO)

N75-25829 Nagoya Univ. (Japan). Dept. of Physics.
ENERGY SPECTRUM OF THE DIFFUSE COMPONENT OF COSMIC X- AND GAMMA RAYS
Y. Tanaka *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 117-124 refs (For availability see N75-25813 16-93)

Preliminary results of two experiments concerning the diffuse component of cosmic X- and gamma-rays are presented: a rocket observation for the range 5 to 80 keV, and a balloon observation for the range 100 keV to 7.5 MeV. The shutter method provided for unambiguous subtraction of the environmental background. The energy spectrum of the diffuse component exhibits a significant change in slope near 22 keV. In the energy range 20 to 200 keV, the spectrum is well expressed by E to the -2.3 power, it seems to flatten above 500 keV, consistent with the possible presence of a bump in the MeV region. Author (ESRO)

N75-25830 Consiglio Nazionale delle Ricerche, Palermo (Italy).
BALLOON AND SATELLITE OBSERVATIONS OF THE DIFFUSE COSMIC HIGH-ENERGY GAMMA RAY FLUX
E. Massaro, N. R. Robba, L. Scarsi, and G. Sironi (CNR, Milan) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 125-133 refs Prepared jointly with Palermo Univ., Italy (For availability see N75-25813 16-93)

Measurement limitations are reviewed of the diffuse cosmic gamma ray flux, due mainly to background produced locally in the telescope itself by cosmic radiation interactions, and the additional atmospheric contribution for balloon-borne experiments. The background characteristics were examined for the various experimental conditions, and the possibility is discussed of determining the real value of the cosmic gamma ray flux in relation to the level of the background present. The experimental determinations of the cosmic gamma ray flux at energy greater than or equal to 10 MeV are analyzed and compared. Due to severe discrepancies between the different observations, the origin of the diffuse gamma radiation based on its energy spectrum and intensity are premature, and no decision as to whether the diffuse spectrum is a simple extrapolation of the X-ray spectrum or a product of different mechanisms can be made. Author (ESRO)

N75-25831* California Univ., San Diego.
A NEW MODEL OF ATMOSPHERIC GAMMA RAYS AND ITS IMPLICATIONS FOR MEASUREMENT OF DIFFUSE COSMIC GAMMA RAYS FROM WITHIN THE ATMOSPHERE
J. L. Matteson, J. C. Ling, and L. E. Peterson (Tata Inst. of Fundamental Res.) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 137-145 refs (For availability see N75-25813 16-93)
(Contract NAS8-27974; Grant NGR-05-005-003)
CSCL 03B

A semi-empirical model is discussed which describes atmospheric gamma rays in the range 0.3 less then or equal to E less than or equal to 10 MeV based on the production per unit mass of air. The model is based on the concept of a source strength (photon/g sec MeV) which is energy- and depth-dependent, and derived from measured fluxes. Quantities such as directional fluxes, angular distributions, and growth curves are calculated directly from this model. The source function is described by four energy-dependent parameters determined empirically from fluxes measured with a 7.5 cm x 7.5 cm NaI counter over the atmospheric depth range from 3.5 to 500 g/sq cm. From S(E,x), obtained for both continuum and discrete gamma rays at lambda = 40 deg, the depth and angle dependence of directional fluxes were calculated. Growth-curve predictions needed to separate atmospheric from diffuse cosmic fluxes were determined. Author (ESRO)

N75-25832* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE ORIGIN OF THE DIFFUSE BACKGROUND GAMMA RADIATION
F. W. Stecker and J. L. Puget (Obs. de Paris-Meudon) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 147-156 refs (For availability see N75-25813 16-93)
CSCL 03B

Recent observations provided evidence for diffuse background gamma radiation extending to energies beyond 100 MeV, and evidence of isotropy and implied cosmological origin. Significant features in the spectrum of this background radiation were observed which provide evidence for its origin in nuclear processes in the early stages of big-bang cosmology, and connect these processes with the galaxy formation theory. A test of the theory is in future observations of the background radiation in the 100 MeK to 100 GeV energy range which are made with large orbiting spark-chamber satellite detectors. The theoretical interpretations of present data, their connection with baryon-symmetric cosmology and galaxy formation theory, and the need for future observations are discussed. Author (ESRO)

N75-25833 Paul Sabaiter Univ., Toulouse (France). Centre d'Etude Spatiale des Rayonnements.
MULTIPLE INVERSE COMPTON SCATTERING AND THE DIFFUSE X-RAY COMPONENT
A. Bui-Van and K. Hurley *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 157-161 refs (For availability see N75-25813 16-93)
(Contract CNES-72-152-212)

It is shown that when multiple scattering is taken into account, the spectrum of inverse Compton produced X-radiation differs from the single-scatter spectrum. The gamma ray fluxes in the 1 to 10 MeV region increase by a factor of about three over the single-scatter spectrum. The significance of this result with respect to the diffuse cosmic X-ray flux is discussed. It is concluded that in the inverse Compton model, the high energy excess depends on the existence of an electron flux sufficiently large to explain the observed diffuse X-ray flux at low energies, and on the existence of the electron spectrum down to energies of 10 MeV. ESRO

N75-25834 Laboratoire de Physique Theorique et des Hautes Energies, Paris (France).
DETECTION OF GAMMA RAYS AND THE POSSIBLE EXISTENCE OF ANTIMATTER ON A UNIVERSAL SCALE
R. Omnes *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 163-169 refs (For availability see N75-25813 16-93)

Physical processes are discussed which can occur if the universe contains as much matter as antimatter. One is a phase separation between nucleons and antinucleons within thermal radiation at very high temperatures, and second is the occurrence of a surface tension between matter and antimatter during the radiative period. The consequences of these effects, which have a bearing on the amount of matter in the universe, on galaxy formation, on gamma ray background, and on the energy mechanism of quasars, are briefly described. Author (ESRO)

N75-25835 Case Western Reserve Univ., Cleveland, Ohio.
A LARGE-AREA BALLOON-BORNE GAMMA RAY DETECTOR c35
T. Jenkins, P. Albats, G. Frye, R. Kolman, S. Schindler, R. Schreiner, G. B. Thomson, and O. B. Mace (Melbourne Univ.) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 171-173 (For availability see N75-25813 16-93)

A gamma ray detector sensitive to gamma rays about 10 MeV and having an effective area of about 1 sq m at 8% efficiency is described. A multiwire proportional counter provides data on the direction of secondary electrons, from which the direction of the initiating photons is inferred. The system consists of an array of seven converter plates alternating with pairs of multiwire proportional counters; the array is surrounded by scintillator anticoincidence counters. A time-of-flight detector below the array triggers the system upon detecting the downward moving conversion products. The Monte Carlo calculations were used to study the expected performance of this apparatus; it was found that the instrument's permits identification of 100 MeV source of 0.000005/sq cm sec to a 3 sigma level in 4h flight. ESRO

N75-25836* California Univ., San Diego.
THE UCSD/MIT HARD X-RAY AND LOW ENERGY GAMMA RAY EXPERIMENT FOR HEAO-A c35
J. L. Matteson, R. M. Pelling, and L. E. Peterson (Tata Inst. of Fundamental Res.) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 177-184 refs (For availability see N75-25813 16-93)
(Contract NAS8-27974)

An HEAO-A spacecraft is described which is scheduled for launch in April 1977 to survey the sky in the 0.15 keV to 10 MeV range of X-rays with improved sensitivity and angular resolution. The spectral and time variations of discrete sources, and the spectrum and isotropy of the diffuse component will be measured. A hard X-ray and low energy gamma ray experiment is described which will use as an array of seven (NaI)(Tl)/CsI(Na) phoswich detectors and eight large CsI(Na) shields. Detector events are pulse-height analyzed with a selectable time resolution of 0.1, 0.005, or 0.00002 sec. The instrument background is expected to be comprised of approximately equal parts of diffuse gamma rays entering the aperture, radioactive decay of spallation products, and gamma ray leakage through the shields. Detailed background predictions are presented, and sensitivity estimates indicate that the Crab nebula should be detected up to approximately 5 MeV. Approximate 1% isotropy limits for the diffuse component of cosmic gamma rays should be achieved, and its spectrum measured with improved precision. ESRO

N75-25837 Consiglio Nazionale delle Ricerche, Milan (Italy). Lab. di Fisica Cosmica e Tecnologie Relative.
A SENSITIVE TELESCOPE FOR LOW ENERGY GAMMA RAY ASTRONOMY c35
D. Maccagni, C. Paizis, F. Perotti, R. Stiglitz, G. Villa, P. Bailey (Southampton Univ.), A. J. Dean (Southampton Univ.), and D. Ramsden (Southampton Univ.) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 185-193 refs Prepared jointly with Milan Univ. (For availability see N75-25813 16-93)

A sensitive, high resolution telescope designed to detect sources whose strength is estimated by extrapolating X-ray spectra into the MeV region and to observe nuclear gamma ray line emission, particularly from supernova remnants, is described. The instrument includes a Compton coincidence detector within a semi-active shield. Two configurations for the detector are presented. The choice between these alternatives will be made after a series of laboratory tests using neutrons and gamma rays. The sources of background radiation at high altitude such as atmospheric gamma radiation, atmospheric neutrons, and spallation products produced by cosmic radiation are discussed. The expected sensitivity of the instrument is estimated at 0.0001 photon/sq cm sec (E greater than or equivalent to 1 MeV). ESRO

N75-25838* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SAS-2 OBSERVATIONS OF GAMMA RAYS FROM THE GALACTIC PLANE c35
D. J. Thompson, G. F. Bignami, C. E. Fichtel, R. C. Hartman, and D. A. Kniffen *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 201-204 refs Partly sponsored by ESRO (For availability see N75-25813 16-93)

Preliminary data are given for the SAS-2 high energy galactic gamma ray observation. These data include both latitude and longitude distributions. The longitude distribution shows a high density region. The latitude distributions toward the center and the anti-center are markedly different, the former showing a two-component structure of half-widths of approximately 3 and 6 deg. The energy spectrum in the range 35 to 200 MeV is hard, consistent with cosmic ray interactions with interstellar matter, including neutral pions decay and emission from energetic electron interactions. The data is consistent with an interpretation in terms of the confinement of the cosmic rays in the spiral arms. Author (ESRO)

N75-25839 Max-Planck-Institut fuer Physik und Astrophysik, Munich (West Germany).
GAMMA RAY OBSERVATIONS OF THE SKY FROM THE TD-1 SATELLITE
W. Voges, K. Pinkau, Y. Koechlin (CEA, Saclay, France), J. Leray (CEA, Saclay, France), G. Boella (Milan Univ.), and G. Sironi (Milan Univ.) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 205-209 refs (For availability see N75-25813 16-93)

Experiment S-133 onboard the ESRO satellite TD-1 to observe the sky for high energy (greater than or equivalent to 30 MeV) gamma rays is presented. Data on galactic gamma ray emission are analyzed. Some problems relating to the extraction of the gamma ray events from the data and investigation of the exposure integral and of the long-term stability of the equipment are discussed. ESRO

N75-25840 Meshed Univ. (Iran).
HIGH-RESOLUTION OBSERVATION OF GAMMA RADIATION FROM THE GALACTIC PLANE
J. Samimi, G. H. Share (NRL, Wash., D. C.), and R. L. Kinzer (NRL, Wash., D. C.) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 211-216 refs (For availability see N75-25813 16-93)

It is shown that the gamma radiation emitted from the galactic plane in the direction of the center is predominantly confined to an approximately 3 deg wide band lying along the equator. Additional data analyzed from the same experiment are consistent with this finding. The narrow emission region implies that a dominant part of these galactic photons are either generated at distance > 4 kpc from earth or that they are not produced uniformly across the assumed approximately 220 pc thick disk. Implications of this result for models describing the gamma ray emissivity of the galaxy are discussed. Data continue to provide evidence for an enhanced emission from the plane in the interval 350 deg < 1 to the 11th power < 360 deg. Evidence is also presented for the existence of a soft component of galactic photons which dominates over the neutral pions decay gamma rays below 50 MeV. Plans to fly a modified version of this experiment are discussed. Author (ESRO)

N75-25841 Imperial Coll. of Science and Technology, London (England).
GAMMA RAY SPECTRUM FROM THE GALACTIC DISC ABOVE 200 MeV
R. K. Sood, K. Bennett, P. G. Clayton, and G. K. Rochester *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 217-220 refs Sponsored by Sci. Res. Council (For availability see N75-25813 16-93)

A telescope sensitive to gamma rays in the energy range 200 MeV to 8 GeV onboard a balloon launched from Longreach, Australia, to scan the galactic center region (330 deg < 1 to the 11th power < 30 deg, -10 deg < B to the 11th power < 10 deg) is briefly described. Partial data analysis shows a signal of (4.1 + or - 1.5) x 0.00001 photon/sq cm sec rad between 500 MeV and 1 GeV. ESRO

N75-25842 Durham Univ. (England). Dept. of Physics.
INTERPRETATIONS OF THE GALACTIC GAMMA RAY DISTRIBUTION
D. Dodds, A. W. Strong, A. W. Wolfendale, and J. Wdowczyk (Inst. of Nucl. Res., Lodz, Poland) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 221-227 refs (For availability see N75-25813 16-93)

The distribution of gamma ray emissivity in the galaxy is discussed. The interpretations of this distribution involving, alternatively, the enhancement of cosmic ray fluxes towards the galactic center and the presence of high gas densities are examined. High cosmic ray fluxes, or high molecular hydrogen densities in the region 4 to 6 kpc from the galactic center may be responsible for the observed distribution of galactic gamma rays. Most of the proposed mechanisms for increased cosmic ray fluxes appear to conflict with radio data, and explanation in terms of high gas densities is considered. An estimate of the expected inverse Compton contribution to the gamma ray flux is made. Author (ESRO)

N75-25843 Max-Planck-Institut fuer Extraterrestrische Physik, Munich (West Germany).
INVERSE COMPTON GAMMA RAYS FROM THE GALACTIC DISC

R. Cowsik and W. Voges *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 229-239 refs (For availability see N75-25813 16-93)

The results of a calculation of the energy and spatial distribution of gamma rays in the bandwidth 100 keV to 300 MeV arising from the various processes in the galaxy are presented. The processes considered are the Compton scattering of the 2.7 K background photons and the starlight by cosmic ray electrons, and also the decay of neutral pions produced in the nuclear interaction of cosmic rays with the interstellar matter. Particular emphasis is given to the strong increase in the density of stellar photons close to the galactic center. This leads to a peaking of the gamma ray fluxes in the direction around the center. The calculated spectral shapes and the angular distributions are in agreement with the available observations in the bandwidth approximately 10 to 100 MeV. The possibility of experimental observation at lower energies is discussed, as are some models proposed for explaining the hard gamma ray emission from our galaxy. Author (ESRO)

N75-25844* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE DISTRIBUTION OF COSMIC RAYS IN THE GALAXY AND THEIR DYNAMICS AS DEDUCED FROM RECENT GAMMA RAY OBSERVATIONS

J. L. Puget and F. W. Stecker (Meudon Obs.) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 241-248 refs (For availability see N75-25813 16-93)
CSCL 03A

Data from SAS-2 on the galactic gamma ray line flux as a function of longitude is examined. It is shown that the gamma ray emissivity varies with galactocentric distance and is about an order of magnitude higher than the local value in a toroidal region between 4 and 5 kpc from the galactic center. This enhancement is accounted for in part by first-order Fermi acceleration, compression, and trapping of cosmic rays consistent with present ideas of galactic dynamics and galactic structure theory. Calculations indicate that cosmic rays in the 4 to 5 kpc region are trapped and accelerated over a mean time of the order of a few million years or about 2 to 4 times the assumed trapping time in the solar region of the galaxy on the assumption that only an increased cosmic ray flux is responsible for the observed emission. Cosmic ray nucleons, cosmic ray electrons, and ionized hydrogen gas were found to have a strikingly similar distribution in the galaxy according to both the observational data and the theoretical model discussed. Author (ESRO)

N75-25845 Commissariat a l'Energie Atomique, Saclay (France).

GALACTIC DISTRIBUTION OF GAS, MAGNETIC FIELD AND COSMIC RAYS c83

J. Paul, M. Casse, and C. J. Cesarsky *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 249-252 refs (For availability see N75-25813 16-93)

To reconcile quantitatively ideas on galactic spiral structure, structure of the galactic magnetic field, cosmic ray containment by fields, and of fields by matter, in quasi-hydrodynamic equilibrium, a model derived from observational data on interstellar gas, synchrotron radiation, gamma rays, and galactic fields, was constructed. The relation between gas density, cosmic ray density, and magnetic field is assumed to be maintained throughout the galactic disk. ESRO

N75-25846* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

RADIO AND GAMMA RAY EVIDENCE FOR A MOLECULAR-ARM FEATURE AT 5 kpc FROM THE GALACTIC CENTRE

P. M. Solomon (Inst. for Advanced Study) and F. W. Stecker *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 253-257 refs (For availability see N75-25813 16-93)
(Grant NSF GP-40768X)
CSCL 03A

Recent measurements of the galactic CO distribution as evidenced from 2.6 mm radio observations of the CO emission line intensity are correlated with the SAS-2 measurements of galactic gamma ray emission. Both distributions are indicative of a ring-shaped distribution or arm consisting of cool clouds of molecular hydrogen at a galactocentric distance of approximately 5 kpc. The mean density of H2 in this region is estimated to be between 1 and 5 cu cm. Both a galactic and extra-galactic origin of cosmic rays are consistent with the observations, although the presence of dynamical effects and increased star formation at 5 kpc in the dense molecular clouds may be connected with an increase in cosmic-ray production. Author (ESRO)

N75-25847 Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany).

INTERPRETATION OF THE GALACTIC RADIO-CONTINUUM AND GAMMA RAY EMISSION

K. P. Beuermann *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 259-263 refs (For availability see N75-25813 16-93)

The nonthermal radio-continuum and gamma ray emission of the galactic disc were analyzed using a spiral-arm model of the galaxy. The results for the 408 MHz brightness temperature and the > 100 MeV gamma ray line intensity as a function of galactic longitude at b to the 11th power = 0 deg are presented. The observational implications, as well as the uncertainties in the calculations, are briefly discussed. An estimate of the possible range of the inverse Compton contribution to the observed gamma ray flux is made. Author (ESRO)

N75-25848 Case Western Reserve Univ., Cleveland, Ohio.

HIGH-ENERGY COSMIC GAMMA RAYS IN THE SOUTHERN HEMISPHERE

G. M. Frye, Jr., P. Albats, G. B. Thomson, V. D. Hopper (Melbourne Univ.), O. B. Mace (Melbourne Univ.), J. A. Thomas (Melbourne Univ.), and J. A. Staib (Madison Coll., Harrisonburg, Va.) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 265-271 refs Sponsored in part by NSF and Australian Res. Grants Comm. (For availability see N75-25813 16-93)

Pulsed 20 MeV gamma rays from the Vela pulsar, PSR 0833-45, were detected on a balloon flight from Longreach, Queensland, using a spark chamber pointed at 35 deg south of zenith. The time average flux was of 0.000015 MeV/sq cm sec MeV. Evidence is also seen for gamma radiation from the Large Magellanic Cloud. A comparison with OSO-7 ray surveys indicates that at least some of the galactic plane gamma rays are from point sources. ESRO

N75-25849* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

OBSERVATIONS OF DISCRETE GAMMA RAY SOURCES WITH SAS-2

D. J. Thompson, C. E. Fichtel, R. C. Hartman, D. A. Kniffen, and G. F. Bignami *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 273-277 refs Sponsored in part by ESRO (For availability see N75-25813 16-93)
CSCL 03A

Compact gamma ray sources centered on the Crab nebula and the Vela X supernova remnant are considered. An excess in the galactic radiation was observed in both regions. Data indicate that a large fraction of this flux is pulsed. The excess from the Vela region could reflect either a large-scale galactic feature, such as a superposition of spiral arm segments, or it could be associated with the Vela supernova remnant. Low-energy gamma ray bursts were observed in the SAS-2 anticoincidence shielding. Author (ESRO)

N75-25850 Harvard Coll. Observatory, Cambridge, Mass. Center for Astrophysics.

OBSERVATIONS OF SOUTHERN SKY GAMMA RAY SOURCES AT E SUB GAMMA GREATER THAN OR EQUAL TO 300 GeV

J. E. Grindlay, H. F. Helmken, R. Hanbury Brown (Sydney Univ.), J. Davis (Sydney Univ.), and L. R. Allen (Sydney Univ.) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 279-285 refs Sponsored in part by Australian Res. Grants Comm. Prepared jointly with Smithsonian Astrophys. Obs. (For availability see N75-25813 16-93)
(Grant NSF GP-38783)

Results of three year observations of the active radio galaxy and X-ray source Cen A (NGC-5128) are reported. The Narrabri optical reflectors were used to detect the atmospheric Cerenkov light from extensive air showers with the double-beam technique allowing partial cosmic ray rejection. An improved timing system was employed and detected pulse heights were recorded so that spectral information is available. Preliminary results are presented, including evidence for the detection of Cen A(NGC-5128). Possible source models and some implications are discussed. Author (ESRO)

N75-25851 Smithsonian Institution, Amado, Ariz. Mount Hopkins Observatory.
THE ATMOSPHERIC CERENKOV TECHNIQUE FOR GAMMA RAY ASTRONOMY c35
T. C. Weekes and G. H. Rieke (Arizona Univ., Tucson) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 287-293 refs (For availability see N75-25813 16-93)

The sensitivities of various versions of the atmospheric Cerenkov technique are evaluated in terms of the effective energy and flux sensitivity for discrete gamma ray sources with power-law spectra. The single-beam, double-beam, and guard-ring configurations are compared. These estimates are based on calculations of the Cerenkov light distribution from an air shower initiated by a 1000 GeV gamma-ray and experimental measurements with the 10 m reflector on Mt. Hopkins, Arizona. Author (ESRO)

N75-25852 University Coll., Dublin (Ireland).
OBSERVATIONS OF THE CRAB PULSAR WITH A WIDE-ANGLE ATMOSPHERIC CERENKOV SYSTEM
N. A. Porter, T. Delaney, and T. C. Weekes (Smithsonian Astrophys. Obs.) *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 295-299 refs Sponsored in part by Natl. Sci. Council of Ireland (For availability see N75-25813 16-93) (Grant EOOAR-0061-69)

Two 1.5 m searchlights are operated in coincidence at Mt. Hopkins, observing the Crab nebula for a pulsed effect at gamma-ray energies of about 50,000 GeV. A wide field (full value 5 deg) was used to test the possibility that the angular distribution of Cerenkov light may be broadened by geomagnetic deflection of the shower particles. Analysis of 88,000 showers from January 1972 shows a 3.8 sigma positive effect (0.66 ms pulse width) or 4.5 sigma (1.3 ms pulse width) at the interpulse position. Results from 138,000 showers in February 1972, however, show only a small, nonsignificant effect, and the overall effect is only at the 3.03 sigma level. Possible implications of the results are discussed. Author (ESRO)

N75-25853 Harvard Coll. Observatory, Cambridge, Mass. Center for Astrophysics.
OBSERVATIONS OF NP 0532 AT 1000 TO 10000 GeV GAMMA RAY ENERGIES c35
J. E. Grindlay, H. F. Helmken, and T. C. Weekes *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 301-306 refs Prepared jointly with Smithsonian Astrophys. Obs. (For availability see N75-25813 16-93)

Observations of NP 0532 (Crab) pulsar were made at the Mount Hopkins high-energy gamma ray Observatory. The ground-based technique is based on the analysis of Cerenkov light emitted in the night sky by E > or = 1000 GeV cosmic and electromagnetic air showers. Observations were made with photomultiplier tube and mirror configurations: (1) a single-beam technique that has an energy threshold of 1000 GeV but does not distinguish shower types, (2) a double-beam technique at a higher energy threshold that distinguishes cosmic ray and electromagnetic air showers, and (3) a single beam with a guard ring that discriminates against off-axis cosmic ray air showers. Preliminary results for the double-beam technique indicate the detection of a net pulsed flux. The width of the pulse is approximately 1 ms and lags the main pulse by 6 ms. A pulsed flux is implied that varies in phase relative to the optical pulsation and appears at 1000 to 10000 GeV energies as a new component with a relatively flat energy spectrum. Author (ESRO)

N75-25854 Consiglio Nazionale delle Ricerche, Milan (Italy). Lab. di Fisica Cosmica e Tecnologie Relative.
THE COS-B EXPERIMENT FOR GAMMA RAY ASTRONOMY c35
G. F. Bignami, G. Boella, J. J. Burger, P. Keirle, H. A. Mayer-Hasselwander, J. A. Paul, E. Pfeffermann, L. Scarsi, B. N. Swanenburg, B. G. Taylor et al *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 307-322 refs Prepared jointly with Milan Univ., Leiden Univ., CEA, Saclay, France, Max-Planck-Inst. fuer Physik u. Astrophys., Palermo Univ. and ESRTC (For availability see N75-25813 16-93)

The experimental package on-board the COS-B satellite is described. Extraterrestrial gamma radiation sources are investigated by observing of gamma rays with energies in excess of 20 MeV. Major areas studied are: the angular structure of gamma ray emission from the galactic plane, the flux of the isotropic radiation from high galactic latitudes believed to be of extragalactic origin, point sources of the radiation, and determination of the energy spectra of all identified sources. Instrumentation included in the experiment are: a 16-gap spark chamber for the identification and determination of the arrival direction of the gamma quanta, a cesium-iodide energy calorimeter for energy determination, a telescope defining the field of view of the experiment, a plastic scintillator anticoincidence shield for the rejection of charged particles, and a proportional counter sensitive to X-rays in the 2 to 12 keV range to synchronize on the possible short period pulsations of gamma ray emission from sources detected to pulsate at X-ray wavelengths. Author (ESRO)

N75-25855 European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
PHYSICAL CHARACTERISTICS OF THE COS-B GAMMA RAY EXPERIMENT
K. Bennett, J. J. Burger, M. Gorisse, H. A. Mayer-Hasselwander, J. A. Paul, E. Pfeffermann, P. G. Shukla, R. Stiglitz, B. N. Swanenburg, B. G. Taylor et al *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 323-337 refs Prepared jointly with Leiden Univ., CEA, Saclay, France, Max-Planck Inst. Fuer Physik u. Astrophys. and CNR, Milan (For availability see N75-25813 16-93)

The overall response of COS-B gamma ray detectors to photons and charged particles is determined by exposing the engineering model to beams at particle accelerators. Tagged photon beams with energies between 20 MeV and 6 GeV were provided and the effect of the charged particle environment in orbit was investigated using proton and electron beams. These beam tests were analyzed to determine the following physical properties of the COS-B payload: susceptibility to charged-particle induced background; effective sensitive area for point sources as a function of the incident photon energy and the source direction with respect to the optical axis; geometric factors for a line source and isotropic radiation; angular resolutions; and energy resolutions. The measurements and analysis procedures are described and the results are presented. It is possible to measure the energy spectrum of the diffuse component of celestial gamma rays with good accuracy up to 500 MeV and to detect point sources with intensities of few times 10 to the minus 7th power photon/sq cm sec above 100 MeV. Author (ESRO)

N75-25856 Max-Planck-Institut fuer Physik und Astrophysik, Munich (West Germany). Inst. fuer Extraterrestrische Physik.
DETERMINATION OF GAMMA RAY DIRECTION OF INCIDENCE IN GAMMA RAY ASTRONOMY SPARK CHAMBERS
P. G. Shukla and H. A. Mayer-Hasselwander *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 339-344 refs (For availability see N75-25813 16-93)

The principles for the detection of gamma ray photons in spark chambers are reviewed leading to the pair-production process and possible determination of original gamma-photon energy and direction of incidence. Methods of gamma ray direction determination are presented. Data on cosmic gamma rays measured by ESRO-TD-1 and NASA SAS-2 satellite spark chambers are reported. Several alternative methods for the extraction of the best possible value for direction from the spark-chamber pictures are studied in connection with the ESRO COS-B which carries a single experiment containing a wire spark chamber with magnetic core memory. The results are presented and the optimum procedure suggested for the orbital data analysis is discussed. Author (ESRO)

N75-25857 Consiglio Nazionale delle Ricerche, Milan (Italy). Lab. di Fisica Cosmica e Tecnologie Relative.
VARIABLE COSMIC X AND GAMMA RAY SOURCES

G. Boella, R. Buccheri, P. Coffaro, D. Molteni, and L. Scarsi *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 345-352 Prepared jointly with Palermo Univ. (For availability see N75-25813 16-93)

Celestial X-ray sources are characterized by the time variability observed in their luminosity. The source intensity versus time profile observed at low X-ray energy (few keV range), where the flux is high enough for a comfortable counting rate at the detector, is used as a valuable tool for the contemporary detection and identification of the source at higher energies where the luminosity could be too low to allow a significant analysis on its own. Information on the source emission mechanism is derived from a knowledge of the time correlation of the fluxes detected in different energy ranges. The feasibility of utilizing the COS-B X-ray detector to establish the reference time profile for the source analysis at various gamma energies is examined. X-ray sources which could become target sources for the COS-B mission are analyzed. Author (ESRO)

N75-25858 Consiglio Nazionale delle Ricerche, Milan (Italy).
GAMMA RAY SOURCE PULSATING PATTERN SYNCHRONISATION VIA SIMULTANEOUS X RAY OBSERVATION IN THE COS-B MISSION c35
G. Boella, R. Buccheri, J. Burger, P. Coffaro, and J. Paul *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 353-362 Prepared jointly with Milan Univ., Palermo Univ., Leiden Univ., and CEA (For availability see N75-25813 16-93)

The COB-B satellite is instrumented with an X-ray proportional counter detector operating in the energy range 2 to 12 keV, known as the pulsar 'synchronizer', in order to search for possible pulsed gamma rays emission from sources identified as pulsars in the X-ray range. The source pulsation period and phase in the satellite reference frame are determined by the X-ray synchronizer for observation time intervals short enough to eliminate the need for corrections for Doppler effect along the satellite orbit and drifts of the on board clock. The continuously updated values of the local period and phase are then used for the time analysis of the source emission in the gamma energy range for which the expected observation time can last up to several days. The phase analysis method developed was tested with Monte-Carlo-simulated X-ray data for a spectrum of period values, pulse structure, and source intensities. Test equipment providing a pulsating X-ray flux was used to test the overall instrument response and the method of analysis. Author (ESRO)

N75-25859 European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
OBSERVATION OF TERRESTRIAL ALBEDO GAMMA RAYS FROM THE COS-B ORBIT c35
R. D. Wills *In* ESRO The Context and Status of Gamma Ray Astronomy Nov. 1974 p 363-368 refs (For availability see N75-25813 16-93)

It is suggested that a cross check of the sensitivities of different satellite-borne gamma ray detectors might be achieved by using the earth's atmosphere as a calibration source. An intensity of gamma rays above 100 MeV at an altitude of 500 km is computed which is consistent with the observed counting rate of OSO-3. If these results can be extrapolated to greater distances and lower energies, they may be folded with the response of the COS-B experiment (as measured at accelerators) to give an estimate of the counting rate to be expected as a function of distance from the earth and the angle between the experiment axis and the earth-satellite vector. The results of such extrapolations are discussed in terms of their implications for a possible orbital calibration of COS-B and for the observation of sources in directions close to the earth. Author (ERSO)

99 GENERAL

N75-25860# Joint Publications Research Service, Arlington, Va.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 350
13 Jun. 1975 50 p Transl. into ENGLISH from Russian reports
(JPRS-65001) Avail: NTIS HC $3.75

Translations and abstracts are presented of articles on meteorology, oceanography, upper atmosphere and space research, astronomy, and terrestrial geophysics, covering both science news and formal scientific reports. Author

N75-25861*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A BICENTENNIAL AGENDA FOR AMERICA
Bruce T. Lundin 21 Mar. 1975 8 p Presented at the Commencement Address, Toledo, 21 Mar. 1975
(NASA-TM-X-71756) Avail: NTIS HC $3.25 CSCL 05D

A commencement address is presented. Topics reviewed include politics, technological developments in science as a whole, and the effects of science on human progress. The social ramifications of satellite technology are also reviewed. J.R.T.

N75-25862# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 28, NUMBER 11
Robert Dolan and Victoria S. Hewitson 30 Nov. 1974 58 p
(AD-A003120; ESN-28-11) Avail: NTIS CSCL 05/21

The monthly publication presents brief articles concerning recent developments in European scientific research. It is hoped that these articles (which do not constitute part of the scientific literature) may prove of value to American scientists by disclosing interesting information well in advance of the usual scientific publications. GRA

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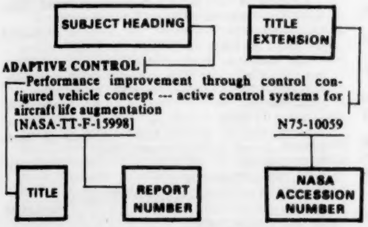
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Evaluation of the energy transfer in the char zone during ablation. Part 2: In-depth response of ablative composites, volume 1

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[NASA-CR-141535] N75-24817

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A cumulative index to Aeronautical Engineering: A special bibliography, January 1975

[NASA-SP-7037[53]] N75-24669

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A cumulative index to Aeronautical Engineering: A special bibliography, January 1975

[NASA-SP-7037[53]] N75-24669

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Aeronautics and space report of the president, 1974 activities

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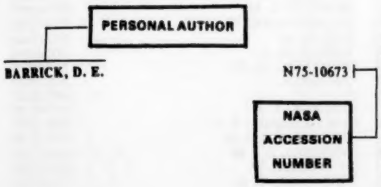

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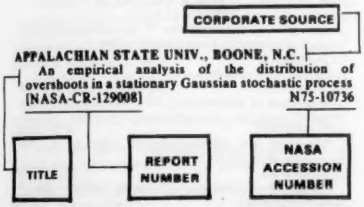
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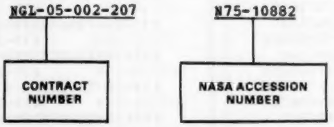

Listings in this index are arranged alphanumerically by contract number. Under each contract number, the NASA accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The NASA accession number denotes the number by which the citation is identified.

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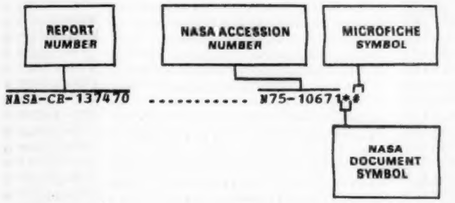

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AD-A008572	N75-25800	#
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AD-A008579	N75-25484	#
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AECL-5014	N75-25736	#
AECL-5023	N75-24872	#
AEDC-TR-74-131	N75-24769	#
AEDC-TR-75-15	N75-24688	#
AFAL-TR-74-208	N75-25171	#
AFAL-TR-74-245-VOL-2	N75-25609	#
AFAL-TR-74-245-VOL-3	N75-25610	#
AFAL-TR-74-344	N75-25717	#
AFAL-TR-74-348	N75-25718	#
AFAPL-TR-73-121-VOL-2	N75-24948	#
AFAPL-TR-74-41	N75-24750	#
AFAPL-TR-74-58	N75-25106	#
AFAPL-TR-74-73	N75-24753	#
AFAPL-TR-74-78	N75-25115	#
AFAPL-TR-74-79	N75-24752	#
AFAPL-TR-74-83	N75-24728	#
AFAPL-TR-74-110	N75-25105	#
AFAPL-TR-74-112	N75-25068	#
AFAPL-TR-74-122	N75-24967	#
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AFCEC-TR-75-1	N75-24767	#
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AFCRL-IP-225	N75-25061	#
AFCRL-SR-185	N75-24686	#
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AFCRL-TR-74-0201	N75-25805	#
AFCRL-TR-74-0284	N75-25156	#
AFCRL-TR-74-0417	N75-24894	#
AFCRL-TR-74-0420	N75-25005	#
AFCRL-TR-74-0459	N75-25744	#
AFCRL-TR-74-0477	N75-24889	#
AFCRL-TR-74-0524	N75-25161	#
AFCRL-TR-74-0540	N75-25378	#
AFCRL-TR-74-0543	N75-25737	#
AFCRL-TR-74-0557	N75-25170	#
AFCRL-TR-74-0560	N75-25743	#
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AFCRL-TR-74-0623	N75-25713	#
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AFCRL-TR-75-0079	N75-25067	#
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AFCRL-TR-75-0170	N75-25742	#
AFCRL-TR-75-0171	N75-24886	#
AFETC-TR-75-15	N75-25015	#
AFETR-TR-75-14	N75-24713	#
AFETR-TR-75-17	N75-25480	#
AFFDL-TR-73-41	N75-24694	#
AFFDL-TR-73-119-VOL-3	N75-24754	#
AFFDL-TR-74-69	N75-24757	#
AFFDL-TR-74-118	N75-24730	#
AFFDL-TR-74-120-PT-1	N75-24862	#
AFFDL-TR-74-156	N75-24694	#
AFHRL-TR-74-33(III)	N75-25587	#
AFHRL-TR-74-78	N75-24768	#
AFLRL-51	N75-25578	#
AFLRL-57	N75-24968	#
AFML-TR-73-107-VOL-2	N75-24923	#
AFML-TR-74-135-PT-1	N75-24946	#
AFML-TR-74-177-PT-1	N75-24954	#
AFML-TR-74-255	N75-24931	#
AFML-TR-75-3	N75-24950	#
AFRPL-TR-74-82	N75-24929	#
AFRRI-TN74-9	N75-25155	#

AFWL-TR-74-3 N75-25172 #
AFWL-TR-74-165 N75-25182 #
AFWL-TR-74-171 N75-25338 #
AFWL-TR-74-196 N75-24700 #
AFWL-TR-74-218 N75-25716 #

AGARD-AG-184 N75-24840 #

AGARD-LS-75 N75-25047 #

AGARDOGRAPH-184 N75-24840 #

AI-22 N75-25641*#

AIRESEARCH-74-10818 N75-24738*#
AIRESEARCH-74-10951 N75-24742*#

AMRL-TR-73-114 N75-25584 #
AMRL-TR-74-127 N75-24729 #
AMRL-TR-74-140 N75-24725 #

ANL-8155 N75-24905 #

ANL/ES-28 N75-25351 #

AOEL-70 N75-25500 #

AP-67-3020 N75-24743*#

APL-JHU-TG-1256 N75-25721 #
APL-JHU-TG-1260 N75-25002 #
APL-JHU-TG-1268 N75-25173 #

APR-88 N75-25751 #

ARAP-225 N75-25489 #

ARDG(FE)-344-5 N75-25808 #

ARL-TR-75-7 N75-25681 #
ARL-TR-75-0003 N75-24955 #

ARL-74-0116 N75-25081 #
ARL-74-0121 N75-25118 #
ARL-74-0142 N75-25749 #
ARL-74-0143 N75-25746 #
ARL-75-0003 N75-24955 #
ARL-75-0004 N75-24847 #
ARL-75-0017 N75-25111 #
ARL-75-0019 N75-24881 #
ARL-75-0022 N75-25658 #

ARL/A-347 N75-25121 #

ARO-VKF-TR-74-90 N75-24769 #

ARO-75-1 N75-25655 #
ARO-3383.34-C N75-24892 #
ARO-4846-17-E N75-24689 #
ARO-4847-31C N75-24883 #
ARO-5329-70-M N75-25729 #
ARO-5413-11-E N75-25486 #
ARO-8623-4-EN N75-25275 #
ARO-8725-9-E N75-25679 #
ARO-10257.8-E N75-25196 #
ARO-10869.1-E N75-24690 #
ARO-11959-2-M N75-25667 #
ARO-12096-RTL N75-24687 #

AROD-9110.4-EN N75-25394 #

ASRL-TR-130-4 N75-24689 #

ATC-B-94300/5CR-3 N75-25019 #

ATC-40 N75-24803 #

ATPR-4 N75-24915 #

ATR-75(7428)-1 N75-24805*#

AWS-TR-75-256 N75-25391 #

BBC-RD-1975/15 N75-24983
BBC-RD-1975/16 N75-25125

BBN-2563 N75-25779 #
BBN-2993 N75-25641*#

BBN-6863 N75-24729 #

BDX-613-1180 N75-25144 #

BEI-74-624 N75-24878 #

BLL-CE-TRANS-5970-(9022.09) N75-25187
BLL-CE-TRANS-5974-(9022.09) N75-24863
BLL-CE-TRANS-5992-(9022.09) N75-25126
BLL-CE-TRANS-6016-(9022.09) N75-25212
BLL-CE-TRANS-6179-(9022.09) N75-25039
BLL-CE-TRANS-6197-(9022.09) N75-25038
BLL-CE-TRANS-6339-(9022.09) N75-25037
BLL-CE-TRANS-6345-(9022.09) N75-25731
BLL-CE-TRANS-6387-(9022.09) N75-25333
BLL-CE-TRANS-6405-(9022.09) N75-25669
BLL-CE-TRANS-6412-(9022.09) N75-25332
BLL-CE-TRANS-6464-(9022.09) N75-25086
BLL-CE-TRANS-6484-(9022.09) N75-25203
BLL-CE-TRANS-6547-(9022.09) N75-24896
BLL-CE-TRANS-6579-(9022.09) N75-25398

BM-IC-8657 N75-25288 #
BM-IC-8659 N75-25354 #

BM-RI-7918 N75-24852 #
BM-RI-7963 N75-24854 #
BM-RI-7984 N75-25283 #
BM-RI-7995 N75-25328 #

BMFT-FB-W-74-10 N75-25794 #

BMPR-17 N75-25257*#

BNL-19487 N75-25694 #
BNL-19488 N75-25693 #

BNWL-SA-5232 N75-25142 #

BNWL-1845-2 N75-25695 #
BNWL-1845-4 N75-25696 #

BRL-CR-212 N75-25232 #
BRL-CR-217 N75-24947 #

BRL-MR-2462 N75-24691 #
BRL-MR-2463 N75-25229 #

BRL-1764 N75-25699 #

BR39563 N75-25624 #
BR47456 N75-24958 #
BR47555 N75-25367 #
BR47556 N75-24942 #
BR47557 N75-24704 #
BR47558 N75-24680 #
BR47624 N75-24902 #
BR47625 N75-24901 #

BSR-4171-VOL-1 N75-24775*#
BSR-4171-VOL-2-BK-1 N75-24776*#
BSR-4171-VOL-2-BK-2 N75-24777*#
BSR-4171-VOL-3 N75-24778*#
BSR-4183 N75-25255*#

BULL-100 N75-25216 #

C-405 N75-25309 #

CADD-7503-1411 N75-25616 #

CCS-211 N75-25633 #
CCS-212 N75-25646 #
CCS-214 N75-25649 #
CCS-215 N75-25617 #
CCS-216 N75-25634 #

CE/MEL-140 N75-25602 #

CEA-R-4617 N75-24917 #
CEA-R-4642 N75-25735 #

CERC-MP-1-75 N75-25277 #

CERC-TM-48 N75-25495 #

COM-74-50063/01 N75-24922 #
COM-74-50944/10 N75-25775 #
COM-74-50944/11 N75-25776 #

COM-75-10126/1 .... N75-25003*#
COM-75-10130/3 .... N75-25754 #
COM-75-10135/2 .... N75-25714 #
COM-75-10137 .... N75-25200 #
COM-75-10186/5 .... N75-24956 #
COM-75-10208/7 .... N75-24925 #
COM-75-10273/1 .... N75-25289 #
COM-75-10276/4 .... N75-25321 #
COM-75-10285/5 .... N75-25282 #
COM-75-10303/6 .... N75-25281 #
COM-75-10307/7 .... N75-25488 #
COM-75-10312/7 .... N75-25285 #
COM-75-10318/4 .... N75-25357 #
COM-75-10319/2 .... N75-25358 #
COM-75-50141/02 .... N75-25330 #
COM-75-50162/7 .... N75-25750 #
COM-75-50193-365-1 .... N75-25792 #
COM-75-50193-365-2 .... N75-25793 #
COM-75-90008-01-01 .... N75-25490 #

CONF-740724-5 .... N75-24918 #
CONF-741001-50 .... N75-25102 #
CONF-741069-2 .... N75-25574 #
CONF-741212-8 .... N75-25142 #
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CONF-741213-10 .... N75-25693 #
CONF-741213-11 .... N75-25694 #
CONF-741213-13 .... N75-25140 #

COO-1195-302 .... N75-25697 #
COO-1367-62 .... N75-25733 #
COO-1591-26 .... N75-24918 #
COO-1591-27 .... N75-24914 #
COO-2166-21 .... N75-24915 #
COO-2288-8 .... N75-24998 #
COO-2296-7 .... N75-24910 #
COO-3257-8 .... N75-25467 #
COO-3352-6 .... N75-25103 #
COO-3476-9 .... N75-24904 #

COSPAR-PAPER-4B.1.10 .... N75-25362 #

CRANFIELD-AERO-28 .... N75-24755 #

CRC-R-1265 .... N75-25204 #

CREARE-TN-204 .... N75-25188*#

C73-892.2/201 .... N75-24945 #

DADC-72165-VT-A .... N75-24692 #

DAR-75-2 .... N75-25154 #

DDA-EDR-8137 .... N75-25106 #

DDC-TR-75-3 .... N75-25768 #

DDESB-TP-10 .... N75-25339 #

DG-41964 .... N75-24737*#

DHEW/FDA-75-8010 .... N75-25303 #
DHEW/FDA-75-8025 .... N75-25580 #

DHPR-75-13 .... N75-25088*#

DLR-FB-73-19 .... N75-24683 #
DLR-FB-73-122 .... N75-24685 #
DLR-FB-74-05 .... N75-24682 #
DLR-FB-74-14 .... N75-24921 #
DLR-FB-74-20 .... N75-25671 #

DLR-MITT-73-35 .... N75-24684 #
DLR-MITT-74-16 .... N75-24749 #
DLR-MITT-74-26 .... N75-24830 #
DLR-MITT-74-42 .... N75-25588 #

DMA/TR-75-001 .... N75-25274 #

DMS-DR-2132 .... N75-24817*#
DMS-DR-2136-VOL-1 .... N75-24818*#
DMS-DR-2136-VOL-2 .... N75-24819*#
DMS-DR-2136-VOL-3 .... N75-24820*#
DMS-DR-2148-VOL-1 .... N75-24814*#
DMS-DR-2148-VOL-2 .... N75-24815*#

DMS-DR-2205 .... N75-24812*#
DMS-DR-2206 .... N75-24816*#
DMS-DR-2251 .... N75-24813*#

DNA-3412F .... N75-24861 #
DNA-3455T .... N75-25701 #
DNA-3467H .... N75-25379 #
DNA-3543F .... N75-25392 #
DNA-3546F .... N75-25753 #

DOL-L73-142-1 .... N75-25759 #
DOL-L73-142-2 .... N75-25760 #
DOL-L73-142-3 .... N75-25761 #

DOT-TSC-OST-74-32 .... N75-24715 #

DOT-TST-75-4 .... N75-24772 #
DOT-TST-75-22 .... N75-25779 #
DOT-TST-75-23 .... N75-25780 #

DR-MA-04-VOL-1 .... N75-24807*#
DR-MA-04-VOL-2 .... N75-24808*#
DR-MA-04-VOL-3 .... N75-24809*#

DR-886 .... N75-25483 #

DRA-TR-74-02 .... N75-25111 #

DREV-4000/75 .... N75-25165 #

DU-4963-7515 .... N75-25360*#

D180-18768-1 .... N75-24802*#
D180-18768-3 .... N75-24801*#

E-7988 .... N75-24843*#
E-8021 .... N75-25686*#
E-8111 .... N75-25620*#
E-8150 .... N75-25092*#
E-8186 .... N75-25726*#
E-8188 .... N75-25093*#
E-8190 .... N75-24740*#
E-8195 .... N75-24943*#
E-8196 .... N75-24746*#
E-8207 .... N75-25192*#
E-8217 .... N75-25095*#
E-8223 .... N75-24745*#
E-8238 .... N75-25094*#
E-8254 .... N75-25098*#
E-8304 .... N75-24866*#
E-8371 .... N75-24739*#

EC-CR-75 .... N75-24850 #
EC-CR-75003 .... N75-24770 #

ECO-75:C-3 .... N75-25263*#

ECOM-72-0317-F .... N75-25308 #
ECOM-73-0306-2 .... N75-25069 #
ECOM-73-0330-F .... N75-25075 #
ECOM-74-0072-4 .... N75-25309 #
ECOM-74-0272-2 .... N75-24773 #
ECOM-74-0377-1 .... N75-25066 #
ECOM-4285 .... N75-25004 #
ECOM-4298 .... N75-25704 #
ECOM-5554 .... N75-25381 #
ECOM-5556 .... N75-25473 #

ENVPREDRSCHF-TECH-NOTE-17 .... N75-25492 #

ENVPREDRSCHF-TECH-PAPER-1-75 .... N75-25475 #
ENVPREDRSCHF-TECH-PAPER-4-75 .... N75-25481 #

EPA-450/2-75-001 .... N75-25353 #
EPA-450/3-74-055 .... N75-25326 #
EPA-450/3-74-056-A .... N75-25341 #
EPA-450/3-74-056-B .... N75-25342 #
EPA-450/3-74-056-C .... N75-25343 #
EPA-450/3-74-056-D .... N75-25344 #
EPA-450/3-74-056-E .... N75-25345 #
EPA-450/3-74-056-F .... N75-25346 #
EPA-530/SW-79D .... N75-25355 #
EPA-530/SW-96C .... N75-25352 #
EPA-650/4-74-030 .... N75-25347 #
EPA-650/4-74-035 .... N75-25489 #
EPA-670/2-74-045 .... N75-25781 #
EPA-670/2-75-026B-VOL-2 .... N75-25340 #

EPRI-SR-3 .... N75-25705 #

ER-7806 .... N75-24747*#
ER-11199 .... N75-24856*#

ERIM-101900-55-L .... N75-25242*#
ERIM-103300-47-L .... N75-25252*#
ERIM-103300-50-L .... N75-25251*#
ERIM-104600-25-L .... N75-25247*#
ERIM-104600-28-L .... N75-25244*#
ERIM-104600-30-L .... N75-25249*#
ERIM-104600-32-L .... N75-25248*#
ERIM-109600-12-F .... N75-25268*#
ERIM-193300-32-F .... N75-25259*#

ERT-P-244-SR .... N75-25341 #
ERT-P-244-2 .... N75-25343 #
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NASA-SP-7036(01)-SECT-1	N75-25235*+
NASA-SP-7036(01)-SECT-2	N75-25236*+
NASA-SP-7037(53)	N75-24669*+
NASA-SP-7037(54)	N75-24670*+

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NASA-TM-X-3236	N75-24740*#
NASA-TM-X-3237	N75-24746*#
NASA-TM-X-3238	N75-25095*#
NASA-TM-X-3242	N75-25094*#
NASA-TM-X-3247	N75-24745*#
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NASA-TM-X-62433	N75-24722*#
NASA-TM-X-62435	N75-24899*#
NASA-TM-X-62440	N75-24903*#
NASA-TM-X-62442	N75-25636*#
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NASA-TM-X-62445	N75-25530*#
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NASA-TM-X-64928	N75-24780*#
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NASA-TN-D-7860	N75-24673*#
NASA-TN-D-7891	N75-24843*#
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NASA-TN-D-7957	N75-25726*#
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NASA-TN-D-8007	N75-24866*#
NASA-TN-D-8009	N75-25651*#

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NASA-TT-F-16323	N75-25541*#
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NASA-TT-F-16418	N75-24867*#
NASA-TT-F-16425	N75-25677*#
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NBS-MONO-25-SECT-12	N75-25750 #

NBS/DIM-59/2	N75-25330 #

NBSIR-74-394	N75-25003*#
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NMRC-KP-107	N75-24956 #
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NOAA-75021814	N75-25793 #
NOLTR-74-63	N75-25703 #
NOLTR-74-186	N75-24969 #
NOLTR-74-209	N75-25104 #
NOLTR-74-220	N75-25158 #
NORSAR-SCIENTIFIC-3-74/75	N75-25395 #
NPS-55EY-75021	N75-25210 #
NRC-TT-1787	N75-24936 #
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NRC-TT-1797	N75-24972 #
NRL-MR-2991	N75-25012 #
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NRL-3007	N75-25074 #
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NRL-7850	N75-25494 #
NRL-7860	N75-25016 #
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NRL-7883	N75-25014 #
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NSF/RA/N-73-137	N75-25319 #
NSF/RA/N-73-138	N75-25233 #
NSF/RA/N-74-019	N75-25314 #
NSF/RA/N-74-047	N75-25316 #
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NSF/RA/N-74-142	N75-25315 #
NSF/RA/N-74-145	N75-25312 #
NSF/RA/N-74-148	N75-24853 #
NSF/RA/N-74-152(2)	N75-25313 #
NSF/RA/N-74-152(6)	N75-25324 #
NSF/RA/N-74-154	N75-25327 #
NSF/RA/N-74-160	N75-25317 #
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NSF/RA/F-74-188	N75-25320 #
NSF/RA/T-74-002	N75-25396 #
NSF/RANN/SE/GI-29729D/PR-74-2	N75-25313 #
NSF/RANN/SE/GI-34979/TR-13-17	N75-25318 #
NSF/RANN/SE/GI-34979/TR-73-14	N75-25233 #
NSF/RANN/SE/GI-34979/TR-73/15	N75-25319 #
NSF/RANN/SE/GI-38102X/TR-74-1	N75-25316 #
NSF/RANN/SE/GI-39457/PR-74-3	N75-25315 #
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NSF/RANN/SE/GI-279976/TR-73-1	N75-25320 #
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NSWC/DL-TR-3252	N75-24734 #
NSWC/WOL/TR-75-17	N75-24980 #
NTSB-AAR-74-16	N75-24701 #
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NUREG-75/011	N75-25349 #
NUREG-75/018	N75-25348 #
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NUSC-TD-4624	N75-25627 #
OCR-99-INT-1	N75-25325 #
ONRL-C-1-75	N75-25377 #
ONRL-C-3-75	N75-25738 #
ORNL-TM-4726	N75-24911 #
ORNL-5006	N75-24871 #
OSURF-3613-73-IF-PT-1	N75-24862 #
OWRT-A-070-MO(1)	N75-25287 #
OWRT-A-080-MO(1)	N75-25284 #
OWRT-B-057-MINN(3)	N75-25286 #
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PB-239049/0	N75-25635 #
PB-239159	N75-25306 #
PB-239255/3	N75-25287 #
PB-239261/1	N75-25327 #
PB-239272/8	N75-25315 #
PB-239276/9	N75-24853 #
PB-239279/3	N75-24895 #
PB-239302/3	N75-25323 #
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PB-239310/6	N75-25759 #
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PB-239371/8	N75-25318 #
PB-239374/2	N75-25317 #
PB-239383/3	N75-25325 #
PB-239387/4	N75-24771 #
PB-239388/2	N75-24772 #
PB-239397/3	N75-25314 #
PB-239402/1	N75-25284 #
PB-239426/0	N75-25162 #
PB-239440/1	N75-25116 #
PB-239441/9	N75-25117 #
PB-239448/4	N75-24701 #
PB-239494/8	N75-25340 #
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PB-239512/7	N75-25316 #
PB-239513/5	N75-25705 #
PB-239523/4	N75-25356 #
PB-239524/2	N75-25201 #
PB-239525/9	N75-25202 #
PB-239526/7	N75-25312 #
PB-239539/0	N75-25119 #
PB-239614/1	N75-25351 #
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PB-239627/2	N75-25120 #
PB-239690/1	N75-25347 #
PB-239694/3	N75-25781 #
PB-239728/9	N75-25345 #
PB-239736/2	N75-25352 #
PB-239748/7	N75-25619 #
PB-239752/9	N75-25763 #
PB-239757/8	N75-25313 #
PB-239761/0	N75-25324 #
PB-239777/6	N75-25326 #

PB-239805/5	N75-25580 #
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PB-239815/4	N75-25772 #
PB-239816/2	N75-25771 #
PB-239817/0	N75-25773 #
PB-239818/8	N75-25770 #
PB-239832/9	N75-25350 #
PB-239834/5	N75-25121 #
PB-240010/9	N75-25779 #
PB-240011/7	N75-25780 #
PB-240023/2	N75-25283 #
PB-240025/7	N75-25286 #
PB-240098/4	N75-24852 #
PB-240101/6	N75-24854 #
PB-240122/2	N75-25397 #
PB-240136/2	N75-25288 #
PB-240154/5	N75-25354 #
PB-240193/3	N75-25349 #
PB-240215/4	N75-25353 #
PB-240263/4	N75-25328 #
PB-240404/4	N75-25396 #
PB-240406/9	N75-25331 #
PB-240423/4	N75-25774 #
PB-240424/2	N75-25329 #
PB-240453/1	N75-25348 #
PE-11991	N75-25716 #
PHM-101-75	N75-25380 #
PM/74/8	N75-25698 #
POLY-EE/EP-75-147	N75-25079 #
PR-4	N75-25543 #
PR-16	N75-25241*#
PR-42-27	N75-25020*#
PR-3090-2	N75-24994*#
PSL-PP00810	N75-25067 #
PSU-AERSP-75-3	N75-24687 #
PTR-10/R-261	N75-24823 #
PUANS-1125	N75-25118 #
PUBL-192	N75-25802 #
PUBL-193	N75-25803 #
PUBL-199	N75-25804 #
PWA FR-4249-VOL-2	N75-24838*#
PWA FR-4249-VOL-5	N75-24839*#
PWA-5231	N75-24926 #
QPR-1	N75-25317 #
QPR-3	N75-25477 #
QPR-4	N75-25153 #
QPR-5	N75-25008 #
QPR-39	N75-25528*#
QR-1	N75-25371 #
QR-2	N75-24773 #
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QR-3	N75-24770 #
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QR-3	N75-25070 #
QR-4	N75-25309 #
QR-6	N75-25181 #
QR-7	N75-25072 #
QTR-5	N75-25011 #
R-ILC-73-22	N75-25181 #
R-206	N75-25583 #
R-841	N75-24714 #
R-1310-ARPA	N75-25498 #
RADC-TR-74-342-VOL-1	N75-24849 #
RADC-TR-74-342-VOL-2	N75-25063 #
RADC-TR-74-342-VOL-3	N75-25064 #
RADC-TR-74-346-VOL-2	N75-25154 #
RADC-TR-75-2	N75-25769 #
RADC-TR-75-19	N75-25007 #
RADC-TR-75-44	N75-24991 #
RADC-TR-75-57	N75-25078 #
RADC-TR-75-62	N75-25211 #
RADC-TR-75-66	N75-24878 #
RAE-LIB-TRANS-1497	N75-24901 #
RAE-LIB-TRANS-1795	N75-24704 #
RAE-LIB-TRANS-1820	N75-25367 #
RAE-LIB-TRANS-1824	N75-24942 #
RAE-LIB-TRANS-1836	N75-24902 #
RAE-LIB-TRANS-1838	N75-24680 #
RAE-LIB-TRANS-1840	N75-24958 #
RAE-TM-MATH-7307	N75-25624 #
RCA/TELTA-TR-74-044	N75-25015 #
RCA/TELTA-TR-74-045	N75-24713 #
RCA/TELTA-TR-74-049	N75-25480 #
RD-75-21	N75-24693 #
RD/B/N-3097	N75-25224 #
RD/B/N-3120	N75-25194 #
RD/B/N-3159	N75-24908 #
RDA-TR-2301-009	N75-25701 #
REPT-2	N75-25327 #
REPT-2-57110/4R-3191	N75-24733 #
REPT-30	N75-25688 #
REPT-40M22410	N75-25290*#
REPT-40M22411	N75-25291*#
REPT-54	N75-25399 #
REPT-75-9G5-GATTT-R1	N75-25043*#
REPT-75-9M7-VERAY-R1	N75-25160 #
REPT-75-113	N75-24822*#
REPT-191-S	N75-25228 #
REPT-411.730	N75-24835 #
REPT-748	N75-25685 #
REPT-749	N75-25293 #
REPT-750	N75-25643 #
REPT-751	N75-25132 #
REPT-1452	N75-25670 #
REPT-1461	N75-25732 #
REPT-1462	N75-25055 #
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REPT-6864	N75-25606 #
REPT-7409.730	N75-25207 #
REPT-7411.737	N75-25206 #
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REPT-80047-85-PT-2	N75-25117 #
REPT-80619-87	N75-25082 #
REPT-80619-88	N75-25083 #
REPT-012131-1-F	N75-25005 #
RESEARCH-BULL-VOL-15-1-75	N75-25666 #
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RFP-2227	N75-24906 #
RK-CR-75-15	N75-24971 #
RK-CR-75-26	N75-25169 #
RK-TR-75-4	N75-25176 #
RL-74-132	N75-25652 #
RLES-ESS-3336-101-75	N75-25196 #
RLO-1388-679	N75-25692 #
RLO-2225-T13-23	N75-25741 #
RLO-2227-T7-27	N75-25335 #
RN-TM-0598	N75-25143 #
ROE-STS-197	N75-24798 #
ROE-STS-198	N75-24799 #
RR-1	N75-25398
RR-74-6	N75-25184 #
RR-120	N75-25785*#
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RSD-88	N75-25362 #
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RSL-TR-265-2	N75-24985*+
RTI-43U-840	N75-24703*#
R11-599	N75-24875 #
S-443-VOL-2	N75-25292*#
SAMSO-TR-75-42	N75-24836 #
SAMSO-TR-75-61	N75-25177 #
SAMSO-TR-75-67	N75-25719 #
SAMSO-TR-75-72-VOL-1	N75-24706 #
SAMSO-TR-75-72-VOL-2	N75-24707 #
SAMSO-TR-75-72-VOL-3-PT-1	N75-24708 #
SAMSO-TR-75-72-VOL-4	N75-24709 #
SAMSO-TR-75-72-VOL-5	N75-24710 #
SAMSO-TR-75-72-VOL-6	N75-24711 #
SAMSO-TR-75-74	N75-24873 #
SAMSO-TR-75-76	N75-24874 #
SAMSO-TR-75-78	N75-25168 #
SAMSO-TR-75-79	N75-25174 #
SAMSO-TR-75-80	N75-24893 #
SAMSO-TR-75-81	N75-25183 #
SAMSO-TR-75-82	N75-25167 #
SAMSO-TR-75-84	N75-25018 #
SAMSO-TR-75-86	N75-25689 #
SAMSO-TR-75-87	N75-24714 #
SAMSO-TR-75-93	N75-25195 #
SAMSO-TR-75-94	N75-25384 #
SAMSO-TR-75-96	N75-25807 #
SAMSO-TR-75-98	N75-25166 #
SAND-74-0073A	N75-25193 #
SAND-74-0235	N75-24870 #
SAND-74-0257	N75-25369 #
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SAND-74-0376	N75-24909 #
SAND-74-0392	N75-24979 #
SAND-74-0403	N75-25139 #
SAND-74-0409	N75-24997 #
SAND-74-8257	N75-25100 #
SAND-74-8510	N75-25227 #
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SAND-75-0337	N75-24766 #
SAO-409-093	N75-25368*#
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SD-74-SA-0047-3	N75-24809*#
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SDC-TM-5292/000/02	N75-25767 #
SD75-SA-0043	N75-24841*#
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SER-50906	N75-24727 #
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SR-5	N75-25743 #
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SR-10	N75-25156 #
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